This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

**Usage guidelines**

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

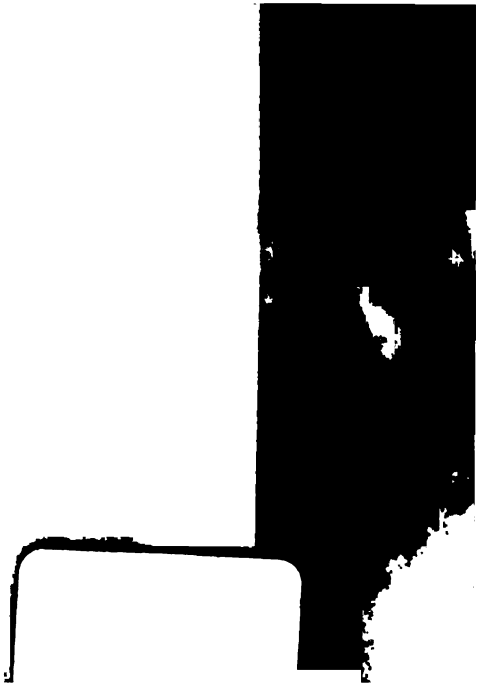
**About Google Book Search**

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

REPORT
BOOK
FOR
MINING
ENG-
INEERS

CHAPLTON

Library
of the
University of Wisconsin



# REPORT BOOK FOR MINING ENGINEERS:

BY


## A. G. CHARLETON, A.R.S.M.

**Consulting Mining Engineer.**

*Past President of the Institution of Mining and Metallurgy; Member of Council of the Federated Institute of Mining Engineers; Member of the American Institute of Mining Engineers; Author of "The Choice of Coarse and Fine Crushing Machinery and Processes of Ore-treatment" (Trans. the Federated Inst. of Mining Engineers awarded an Institution Prize in 1894); Notes on "Tin Mining;" "Gold Mining and Milling in Western Australia;" "The History, Distribution, Mining, Dressing and Metallurgical Treatment of Nickel Ores" (two "Papers" awarded a Silver Medal by the Society of Arts in 1894—1895), etc.*


---

SECOND EDITION.

*Revised and Enlarged.*

---


London:

WHITEHEAD, MORRIS & Co., LTD., Printers, 9 & 10, Fenchurch Street, London, E.C.

1908.

THE annexed blank-form of Report is designed, so as to enable a comprehensive report to be obtained, in a compact shape, upon properties that mine owners or purchasers wish to sell or acquire; and may be used by mining engineers as a field note-book.

As stated in the Preface, it is hoped that this little work will be found suggestive and useful both to engineers and business men; presenting, in a concise form, a brief outline of information which it is necessary to have, in order to obtain a proper idea of the value of mining-property.

This edition has undergone considerable revision and some enlargement, and it is hoped by the Author, that it will be found to be improved in general form, as well as by the addition of data, given in tabular shape at the end, that should be of service in making various calculations, in places where an engineer has not always got works of reference at hand.

The writer hopes that many of the faults and shortcomings of the previous publication have been corrected, and that it will appeal in its present shape to a much larger circle of professional and business men.

By using "carbon" sheets any part of this Report can be copied; an indelible pencil is recommended for filling in.

Slip a *broad* elastic band round this book, or carry it in a canvas pocket, which you can have made for the purpose.

The weight of this book is approximately 12 oz. for posting. It may be reduced, if desired, by tearing out the Questions and Table pages 27—141.

To protect the leaves from damp and wet underground, insert a sheet of "oiled silk" between the last page used and the next, which can be held in place by means of two thin elastic bands.

A sheet of tracing-cloth will be found folded in at the end of the book, on which a plan of the "underground-workings" can be traced on a suitable *small* scale; this will be found to greatly facilitate their rapid inspection, and will aid the Engineer in making notes upon them.

123513
OCT 22 1908
MLFD
C38

# PROFESSIONAL DIRECTORY

## SPECIAL CONTRIBUTORS.

THE AUTHOR and PUBLISHERS will be pleased to offer any Mining Engineer or Metallurgist submitting a useful suggestion that they consider of sufficient value, to incorporate in the *next Edition* of this Book, a space of 1 in. × 1½ ins. for the insertion of his business "Card," free of charge, if he chooses to avail himself of it.

| Mining Engineers. | Metallurgists. |
|---|---|
| | |
| | |
| | |
| | |
| | |



bc62902

# CHARLETON'S REPORT BOOK

FOR

# MINING ENGINEERS.

## PREFACE.

IN publishing the Second Edition of this pocket-book, the Author desires to repeat a few words of explanation in regard to its scope and the use to which it is intended to be put.

Its compilation is the outcome of some twenty-seven years' experience, gained by him in mine inspection and mine management in various districts in different parts of the world, including Germany, Bohemia, France, Canada, the United States, India, Australia, South America and elsewhere; his idea being to endeavour to supply a want he has often himself felt, viz.: a *systematic* method upon which to base reports, that will save the engineer an unnecessary waste of labour and time, and enable him to preserve a record of his work in a condensed and handy form for subsequent reference; so that the salient points can be picked out in a few minutes, without the necessity of wading through pages of MS. or typewritten notes.

The work as it stands merely *suggests* broad lines for the engineer to follow, whilst leaving ample scope for the exercise of that most important factor in success—his *personal* judgment. Indeed, the "Questions" in this book will serve but little purpose unless practically and *thoughtfully* applied, to the requirements of *each* individual proposition.

It will be the Author's endeavour, however, to keep pace with improvements and developments, and in future editions he hopes to add to the pocket-book, and to obviate any omissions or imperfections which may be found in the present edition.

With this object, he invites, and will be glad to receive, any suggestions; *vide* note to "Professional Directory" preceding this Preface; his desire being, to make the book thoroughly *practical*, and, as far as possible universally applicable.

The ground it covers is of course familiar enough to "mining men" generally, but it often happens that for want of a fixed system of enquiry, even an experienced engineer sent out to make a report on a property may overlook some important point, and only discovers the oversight when, having left the spot, it is too late to rectify it. It is hoped that by employing this book, the inconvenience which may thus be caused when a report comes to be written up and handed in, will be avoided.

Further, it is the Author's hope that the book will serve as some protection and guide to the Directors of Mining Companies and purchasers of mining property, in indicating those technical points which are most essential to ascertain, in order to properly estimate the value of mines they may think of acquiring.

Even with the most accurate and searching questions, it is obvious, however, that the value of the replies must largely depend on the intelligence, experience, and good faith of the person answering them.

The best and only real safeguard against risk is to employ thoroughly reliable, competent, and experienced engineers, to make such reports, which often involve very great responsibility, where large sums of capital are at stake; men whose reputation is a sufficient guarantee that their work will be thoroughly well done; whilst a first class firm of Consulting Engineers to advise the purchasers, is naturally an additional safeguard; however capable the engineer who makes the report may be, and is frequently a great assistance to him.

Most of the failures and losses in mining that are not attributable to defective company constitution, or financial mismanagement, may be traced to neglect of these necessary elementary precautions; though the best "expert" in the world is not infallible, when a question is one of mere opinion. A clear line of distinction should, however, be drawn between errors of judgment, and errors in regard to facts.

The Author's purpose will have been attained, if this new edition tends to diminish the ordinary risks involved in mining business, which are fortunately becoming smaller, as it is now generally carried on upon a sounder basis; and scientific ***business methods***, aiming at increased metallurgical economies, the utilization of bye-products, and the installation of plant of the

best design and construction for the purpose for which it is to be employed, are gradually taking the place of rule of thumb practice, haphazard speculation, and obsolete machinery.

There is scarcely any form of industrial or business undertaking in which shareholders generally are furnished with such a large amount of detailed, reliable information; and there is usually no lack of data for determining the particulars in which a badly managed property fails; it is their own fault if they do not avail themselves of it.

The Author would point out that it is, of course, impossible to fill in answers to all the various questions in this book, and the completeness with which this can be done, will entirely depend on the position of the property, its state of development, and local conditions.

More or less complete answers ought, however, to be forthcoming, under all the more important headings in every case.

In conclusion the Author desires to thank Prof. Gowland and Prof. Cox, and Messrs. Alfred James, C. G. Warnford Lock, John A. Dennison, and Arthur Dickinson for valuable suggestions embodied in this edition, and numerous other professional friends for their kind appreciation of the First Edition of this book, which has rendered it requisite for the Publishers to issue a Second Edition. This has undergone considerable revision, and possesses some new features, but the original form of the book has been retained as far as possible, as it appears to have given satisfaction to those who have used it. The Author has also specially to acknowledge the kindness of Mr. Bernard MacDonald (the Author of an American "pocket-book") in permitting him to use two tables, incorporated in this edition, and for some useful features, embodied in the arrangement of the first section of the First Edition, which have been retained in the present one.

353, MANSION HOUSE CHAMBERS, LONDON, E.C.,
*April*, 1908.

A. G. CHARLETON.

NOTE.—Arrangements can be made for telegraphing or receiving a reply to any question or series of questions in this book by arranging a code-word with the reporting engineer, meaning: Telegraph reply to (page No..... or No..... question) in Charleton's Report Book, Second Edition.
Reference is made on each page of instructions in the "Skeleton-Report", to questions bearing upon the subject dealt with; which will be found tabulated at the end of this book, pages 27 to 82.

# MINE VALUATION.

**There are NINE points which it is of primary importance to know in order to determine the present value of a non-producing partially developed metalliferous Mine with a more or less fixed or assumed life; without taking into account any speculative value it possesses outside of this:—**

1. The "ore in sight" (i.e., developed on three or more sides) and its gross value.
2. The loss in the process of reduction.
3. †The cost of plant, roads, &c.
4. The cost of mine development (including shaft-sinking, etc.) up to the commencement of milling operations.
5. The cost of subsequent development, mining, milling, management, general expenses, etc.
6. *The "life of the mine" or time required to exhaust the property.
7. The time required for development, to bring the property into full working order.
8. The cost of forming the Company.
9. The value of the machinery when the property is exhausted. (This can be taken generally as being *nil* at the end of a period of say nine to twelve years.)

*The practical application of such information was pointed out in an article in the "*London Mining Journal," *February 9th*, 1895; *and if the state of development of the property admits of doing so, these questions should be satisfactorily answered, to enable the capitalist to form an opinion of the consideration that might fairly be paid for the property; and the amount at which it might reasonably be capitalised, to return adequate interest, upon the proposed investment, allowing for the redemption of the capital; which indirectly more or less fixes the consideration that the "vendors" should expect to receive; taking into account the amount of "working capital" that must be provided.*

*Papers that may be consulted upon this subject: "The Valuation of Mines of definite Average Income," by H. D. Hoskold, Trans. American Institute of Mining Engineers, 1902, and "Determination of the Present Value of a Mine on the Rand," by Fred. Hellmann, Trans. Inst. of Mining and Metallurgy, vol. VI.*

† On the Rand, it is probably safe to calculate on 5½ to 6 tons per stamp, being crushed per diem for 300 working days.

* In some instances this factor cannot be fixed at all; in others it is more or less definitely settled as in the case of the Rand, where "claims" are bounded by vertical "side-lines."

GENERALLY speaking, the man who has been fortunate enough to discover a gold reef or other metalliferous vein, hearing of the high prices asked and paid for similar properties, is apt to exaggerate *its real value*; which has to be considered apart, and distinguished from any prospective or speculative value it may possess.

The difficulties to be met by a mining engineer employed by a purchaser or company, after he has made an estimate of the "ore in sight" and "probable reserves" upon which profits have to be calculated, are not unfrequently accentuated by the vendors themselves failing to see that they must allow the purchasers of a partially developed, but *non-producing* property a comparatively high rate of interest for the risk that is incurred in its promotion and purchase; whilst on the other hand, if the rate of interest they demand is excessive, the purchasers may stand in their own light and lose a good property. The risk is an element which it is most difficult to estimate when arranging the terms that the purchaser may be reasonably allowed.

Probably the best plan is for the engineer to estimate the value of the property at several rates of interest, and submit them for consideration, so as to enable his employers to negociate the matter for themselves on what they consider a suitable basis.

If, for example, the vendors own a property estimated to contain *704,000 tons of ore "in sight" and "probable," and the following points have been determined:—

1st—That the ore averages 12 dwt. in gold per ton.
*2nd—That there will be a loss of 2 dwt. per ton in treatment.
*3rd—That the cost of plant will be £15,000, and the cost of surface works, roads, etc., will be £5,740.
4th—That the initial cost of mining development will be £10,000.
5th—That the cost of subsequent development, mining, milling, management, general expenses, etc., will be £1 10s. per ton.
6th—That the time required to exhaust this ore will be 11 years from the time that crushing starts.
7th—That the time necessary to bring the property into full producing condition will be two years.
8th—That the cost of forming a company will be about £6,000.
9th—That the value of the machinery should be taken as *nil* at the end of 11 years running.

the valuer is practically in possession of the necessary facts to estimate the actual present value of the property; and he only requires to know the interest the vendor will allow the purchasers.

Should they be allowed 20 per cent. per annum upon their purchase-money, and to redeem the capital at †2½ per cent. per annum, when the profits are deferred two years, the vendor would receive £58,006 17s. 4d. for his mine; but should the purchasers look for 40 per cent. on their purchase-money, the capital being redeemed and the profits deferred, as in the former case, the vendor would only get 16s. 4d. for it!

* These figures have only been taken for the sake of illustration, as you would rarely find a property with so large a tonnage of ore "in sight" for sale; the assumed loss of gold could be very much reduced by cyanide or other treatment; and the expenditure on "plant" would probably be very much greater for a mine of this size.

† The usual rate under present conditions would be 3 or 4 per cent.

In order, therefore, to do justice to both parties, the first thing to ascertain is the annuity or annual profit which the mine may be reasonably expected to yield.

*Valuing the ore which is assumed to contain 12 dwt. of fine gold† at £2 10s. 10·8d. per ton, we have in round figures :—

| | | | | |
|---|---|---|---|---|
| 704,000 tons at £2 10s. 10·8d. .. .. .. .. .. .. .. .. .. .. .. .. .. = | | | | £1,791,680 19 4 |
| *Less* the "Bank" value of 2 dwt. lost in reduction .. .. .. .. .. .. .. .. .. .. .. = | £298,613 6 8 | | | |
| ,, cost of development, mining, milling, management, royalties, etc., on 704,000 tons at £1 10s. 0d. per ton = | £1,056,000 0 0 | | | |
| | | | | 1,354,613 6 8 |
| Net estimated gross profit to be derived from the "ore in sight" and "probable ore" .. | | | | £437,067 12 8 |

and $\frac{437,067 \cdot 12 \cdot 8}{11}$ = £39,733 8 5 the annuity or annual profit to be derived during the whole producing period of 11 years.

The present value of £1 per annum in 11 years so as to allow the purchasers 20 per cent. upon their purchase-money, and to redeem their capital at 2½ per cent. per annum when the profits are deferred two years, is 2·479347.

| | | | | |
|---|---|---|---|---|
| Therefore, £39,733·333 × 2·479347 = the estimated present gross value of the "ore in sight" and "probable ore," viz... | | | | £98,512 14 4 |
| From which deduct cost of plant .. .. .. .. .. .. .. .. .. .. .. | £15,000 0 0 | | | |
| ,, ,, ,, ,, ,, development .. .. .. .. .. .. .. .. .. .. | 10,000 0 0 | | | |
| ,, ,, ,, ,, ,, surface works .. .. .. .. .. .. .. .. .. .. | 5,740 0 0 | | | |
| ,, ,, ,, ,, ,, company formation.. .. .. .. .. .. .. .. .. | 6,000 0 0 | | | |
| | 36,740 0 0 | | | |
| ‡ ,, ,, ,, compound interest on £36,740 for 2 years at 5 per cent. (as customary in colliery valuations) during the time of development .. .. .. .. = | 3,765 17 0 | | | |
| | | | | 40,505 17 0 |
| Net value of property .. .. .. | | | | £58,006 17 4 |

But the present value of £1 per annum for 11 years when the purchasers are allowed 40 per cent. per annum, and to redeem the capital at 2½ per cent. per annum, profits being deferred two years, is 1·01947.

| | | | | |
|---|---|---|---|---|
| Therefore, £39,733·6·8 × 1·01947 makes the estimated present gross value of the "ore in sight" and "probable ore" only | | | | £40,506 13 4 |
| From which deduct cost of plant, development, etc., as above.. .. .. .. .. .. .. .. .. .. | | | | £40,505 17 0 |
| Net value of property .. .. .. ... | | | | £ 16 4 |

† Taking the Bank price at £4 4s. 9·8182d. per oz. = 4s. 2·89d. per dwt.

*This calculation would of course be simplified in practice by taking the net yield of gold, i.e., 10 dwt., as a direct basis of calculation; and the value of the gold would be expressed simply in shillings and decimals.

‡ In the original "Article" in which these figures were given, the item thus marked was deducted from the value of the property as above shown; but it seems to the Author that it would be more correct practice to omit this charge altogether, because, as a matter of fact, the *purchasers* would be receiving interest for the first year or 18 months on the unspent portion of the £36,740 0s. 0d., laid out on plant. Consequently, the vendors of the mine should be credited instead of being debited with interest upon the money set aside for development and purchase of machinery.

Under conditions such as those above stated it is evident therefore that the vendor could not allow the purchasers anything approaching 40% interest on their purchase money, and 20% would formerly have been considered rather a low rate to allow upon a mine abroad; although even 10% or less may be sometimes accepted, in cases where there is considerable probability of the life of the property being extended beyond the period assumed.

Allowing 30% per annum to the purchasers the net present value of the mine would work out at £18,204 3s., the price in cash or shares that the writer of the "Article" in the Mining Journal, thought might perhaps be accepted as reasonable by both sides; or the vendors might possibly agree to allow the purchasers, a comparatively high rate of interest as a basis for the cash payment; they receiving an additional share interest to cover "probable ore;" such cash and shares representing a fair proportion of the total capital of the Company. The purchase consideration is, however, not infrequently arranged almost entirely on a share basis; but the purchasers should always hold a controlling interest.

The above illustrations merely serve to indicate the broad lines upon which a valuation can be based, but the figures will vary of course *ad infinitum*, with every modification in factors that must be taken into consideration; apart from those already enumerated, such as accessibility, climate, water-power, labour-supply, and market value of products, etc.

The most practical way of dealing with the problem, seems to be, to fix the *maximum cash* to be paid in proportion to the net value of the plant and machinery (if any) and ore reserves "*in sight*" at the date of the sale; with a *share consideration* (based upon the general prospects of the mine, "probable ore," etc., and the expenditure that must be incurred to bring it to a producing position) that seems likely to permit of the property paying *adequate interest* upon the gross nominal capital of the Company to be formed, for *x* term of years; this should allow of extinguishing the purchase consideration, and yield a rate of interest that is likely to cover the risk incidental to the venture.

Mr. George A. Denny contributed an interesting article to the Mining Journal of August 24th, 1907, upon the Commercial Aspect of Rand profits, in which he touches upon the question of "mine development redemption," which is dealt with in different ways. One group of mines, for example, commences production after having spent in shaft and mine development in some cases, several hundreds of thousands of pounds. Thereafter, it theoretically develops as much ore as it mines, and charges the outlay in the current "working costs," the reserves, supposedly, not being entrenched upon. But it makes no attempt to redeem the hundreds of thousands of pounds which have been spent prior to the producing era, nor to pay any interest thereupon.

For the purpose of the original shareholder the "profits" distributed should first be subjected to redemption charges, otherwise the capital sum must be eventually lost; and the dividends will only represent interest, which may or may not be adequate.

Take an actual case for instance of a mine that has expended approximately £300,000 on shafts and development work twelve years previously; this sum, if invested in a three per cent. security and allowed to accumulate, would now have reached a total of £428,000, and be available for distribution. That amount, therefore, at least, stands unredeemed to the debit of "mine development." As a mine is a "wasting asset" the burden of such a charge becomes greater and greater year by year, and the property becomes correspondingly less able to stand the burden.

The investor is generally expected and left to make the necessary provision out of income for himself, which he can do by reinvesting a portion of his profits with a view to maintain his capital intact, as every prudent man should do, but he generally trusts to selling his interest for a sum approaching what he gave for it before the mine becomes exhausted.

Moreover, the current market price of the shares in a Mining Company is *supposed* to be an index of the present value of the ore-reserves, machinery, etc., plus the probable future production of the mine for several years ahead. Unfortunately, it is seldom a *true* index of these three elements of value; were it so invariably it would do away with the necessity to provide for depreciation (which is always calculated on a more or less arbitrary basis), and *automatically* and *gradually* extinguish the risk that an allowance for depreciation is supposed to provide for, as the property becomes exhausted. The principle of "share valuation" is explained at the end of the book.

# CHARLETON, DICKINSON & CO.,

A. G. CHARLETON, A.R.S.M., M.I.M.M. ARTHUR DICKINSON, A.R.S.M., M.I.M.M.

## Consulting Mining Engineers,

UNDERTAKE Inspections and Reports; the management of Mining Properties; and the Design of Mining Plant.

Advise upon Mining and Metallurgical questions, connected with the working and treatment of ores of Gold, Silver, Lead, Zinc, Copper, Tin, Nickel, Cobalt, Antimony, and Manganese, in all of which metals they have had experience. They endeavour to keep in touch, as far as possible, with the latest advances in mining practice and metallurgical processes in various parts of the world.

Their personal knowledge of different mining fields extends over Cornwall, Saxony, Bohemia, the Pyrenees, Norway, Spain, India, Australia, Tasmania, New Caledonia, Canada, the United States, and South America.

Address—353, MANSION HOUSE CHAMBERS, LONDON, E.C.

*Telegraphic Address:* "INGRESSIO, LONDON."
*Telephone No:* 11,232 CENTRAL.

Use { BEDFORD McNEILL'S (old and new 1908 editions) and MOREING & McCUTCHEON'S CODES.

# TABLE OF CONTENTS.


| | PAGE |
|---|---|
| Preface: "Mine Valuation," etc. | |
| "Covering Letter" and Address of Engineer .. .. .. | 1 |
| Names of Claims or Leases; Area and Date of Location .. | 2 |
| Description of Claims or Leases.. .. .. .. .. .. | 3 |
| Geography .. .. .. .. .. .. .. .. .. .. | 4 |
| History of Property .. .. .. .. .. .. .. | 5 |
| Accessibility .. .. .. .. .. .. .. .. .. | 6 |
| Titles .. .. .. .. .. .. .. .. .. .. | 7 |
| General Characteristics of Lodes or Mineral Deposits .. .. | 8 |
| Geology .. .. .. .. .. .. .. .. .. | 9 |
| Developments .. .. .. .. .. .. .. .. | 10 |
| Mining Facilities .. .. .. .. .. .. .. .. | 11 |
| Water Supply.. .. .. .. .. .. .. .. .. | 12 |
| General Supplies, Notes on. .. .. .. .. .. .. | 13 |
| Mining Supplies .. .. .. .. .. . .. .. | 14 |
| Labour and Contract Work .. .. .. .. .. .. | 15 |
| Ore Tonnage "in Sight" and "Probable Ore" .. .. .. | 16 |
| Weights of Metals and Ores; (Specific Gravities, etc.) .. .. | 17 |
| Assays or Pan-Tests .. .. .. .. .. .. .. | 18 |
| Shipments and Proceeds .. .. .. .. .. .. .. | 19 |
| Reduction Plant .. .. .. .. .. .. .. .. | 20 |
| Estimate of Profit .. .. .. .. .. .. .. .. | 21 |
| Terms of Sale .. .. .. .. .. .. .. .. | 22 |
| Plan of the Property: Longitudinal and Cross Sections .. | 23 |
| Travelling Expenses .. .. .. .. .. .. .. | 24 |
| Enclosures .. .. .. .. .. .. .. .. .. | 25 |
| Routes and Time necessary to reach the Property .. .. | 26 |
| Questions to be enquired into (Codified)— | |
| Character of Ore and General Features of the Deposit .. | 27-33 |
| Developments; Ground Stoped; Timbering, etc. .. .. | 34-35 |
| Neighbouring Mines: Surface Indications; Distances; Water; Pumps; Haulage; Ventilation; Compressed Air; and Explosives, etc. .. .. .. .. .. .. | 36-40 |
| Supplies: Fuel and Timber .. .. .. .. .. .. | 41 |
| Progress Underground; Description and Position of Shafts; Machinery and Cost of Plant; Time Required for Erection; Climate; Rainfall, etc. .. .. .. .. | 42-43 |
| Labour, Mining Laws and Regulations; Local Taxes; Royalties; Labour Conditions, etc. .. .. .. .. | 44 |
| Public Crushing Mills; Mill Site; Shipment of Ore; and Terms of Sale .. .. .. .. .. .. .. | 45 |
| Copper Mine, Questions relating to. .. .. .. .. | 46-47 |
| Lead or Zinc Mine, Questions relating to. .. .. .. | 47-49 |
| World's Production, Supply, Consumption, and Price of Metals .. .. .. .. .. .. .. .. | 49 |
| Sorting and Sizing Tests; Mill Engines; Particulars of Stamps and Battery; Concentrators; Staff; Cost of Plant; Amalgamation Results; Cost of Milling and Concentrating; Tailings losses, etc. .. .. .. | 50-58 |
| Time Crushing lasted; Ore Sorting; Huntingdon Mill; Rolls; Roasting and Chloridizing; Gold and Silver losses; Costs; Fineness of Bullion; Cyanide Treatment; Lixiviation; Metal Saving; Cost of Production of Gold and Silver per oz. .. .. .. .. .. | 59-61 |
| Enlargement of Works; Purchase of Ores; Smelting Works; Description and Capacity of Furnaces; Extraction of Metals; Fluxes used and Cost of Smelting | 62-63 |

PAGE

Labour employed at Mine, Mill and on Surface; Consumption of Fuel, etc.; Size and Power of Engines and Boilers or Water Motors; Water available for Power; Cost of Traction of various kinds; Nature of Exploratory and Development Work already done; Particulars of Yield, etc., during the last three years .. 66-69

Improvements; Proposed Output maintainable; Past Results; Ore on Dumps; Present Estimated Value of the Mine, Machinery, Surface Works, Tools, and Supplies; Gross and Net Profits; Redemption of Capital; Depreciation of Plant; Capitalization the Property can stand; Working Capital needed .. .. 70-73

Proposed Development work; Reasons for Past Failure; Liabilities; Titles; Maps and Plans; General Recommendations and Conclusions .. .. .. .. .. 74-75

Placer Mine, questions relating to:—Area; Value of Gravel or Cement; Thickness; Trial Pits; Character of Gravel; Thickness of Overburden; Dumping Ground; Working Season; Outlay for Plant; Water available; Ditches; Flumes; Pipes, etc.; Working Particulars of Cost: Staff; Reservoirs; Gravel moved; and Legal Restrictions .. .. .. .. .. .. .. .. 75-80

"Deep Lead," "Cement Claim" and "River Claim," questions relating to:—Value; Crushing; Dredging; Stock of Tools and Capital Requirements.. .. .. 81-82

Tin Mine, Questions relating to. .. .. .. .. .. 82

Pan Tests (Gold Table) .. .. .. .. .. .. .. 83

"Panning Tests" .. .. .. .. .. .. .. .. 84-85

Analysis .. .. .. .. .. .. .. .. 86-87

Statement Showing Work Done and Cost of Trucking and Hoisting .. .. .. .. .. .. .. .. .. 88

Table Showing Work Done, Stoping on Contract, etc. .. .. 89

Table Showing Quantity of Ore Broken in Stopes, etc. .. .. 90

Table Showing Monthly Progress and Cost of Development per Metre or Foot .. .. .. .. .. .. .. .. 91

Distribution of Gold, Silver or other Metals in an Ore .. .. .. .. .. .. Table I. 92

Sizing Test .. .. .. .. .. .. ,, II. 93

Power for a Mill .. .. .. .. .. ,, III. 94

Wear of Shoes and Dies .. .. .. .. ,, IV. 95

Screen Sizes .. .. .. .. .. .. ,, V. 96

Woven Wire Screens .. .. .. .. ,, Va. 97

Wear of Screens .. .. .. .. .. ,, VI. 98

Amalgamation of Concentrates .. .. .. ,, VII. 99

Gold Milling Costs.. .. .. .. .. ,, VIII. 100

Mine Wages .. .. .. .. .. .. ,, IX. 101

Mill Wages .. .. .. .. .. .. ,, IXa. 102

Gold Mill Returns .. .. .. .. .. ,, X. 103

Gold Saving .. .. .. .. .. .. ,, XI. 104

Trial Crushing Results .. .. .. .. ,, XII. 105

Amalgam Saving .. .. .. .. .. ,, XIII. 106

Consumption of Mercury .. .. .. .. ,, XIV. 107

Huntington Mill .. .. . .. . ,, XV. 108

Barrel Chlorination.. .. .. .. .. ,, XVI. 109

Vat Chlorination .. .. .. .. .. ,, XVII. 110

Cyanide Process .. .. .. .. .. ,, XVIII. 111

Do. .. .. .. .. .. ,, XVIII. 111A

Do. .. .. .. .. .. ,, XVIII. 111B

Do. .. .. .. .. .. ,, XVIII. 111C

Do. .. .. .. .. .. ,, XIX. 112

Do. .. .. .. .. .. ,, XIXa. 113

| | | | PAGE |
|---|---|---|---|
| Cyanide Process .. .. .. .. .. | Table | XIXb. | 114 |
| Do. and Value of Bullion Products.. | ,, | XIXc. | 115 |
| Do. (Treating a Sulphide Ore "Roasted") | ,, | XIXd. | 116 |
| Do. (Treating a Sulphide Ore "Raw") | ,, | XIXe. | 117 |
| Do. (Sands Treatment) .. .. | ,, | XIXf. | 118 |
| Do. (Slimes Treatment) .. .. | ,, | XIXg. | 119 |
| Lixiviation, Ordinary .. .. .. .. | ,, | XX. | 120-121 |
| Do. do. (Time Taken) .. .. | ,, | XXI. | 122 |
| Do. Trough (Time Taken) .... .... | ,, | XXII. | 123 |
| Working Results in Roasting and Ordinary Lixiviation .. .. .. .. .. | ,, | XXIII. | 124 |
| Lixiviation, Ordinary (Working Details) .. | ,, | XXIV. | 125 |
| Russel Process .. .. .. .. .. | ,, | XXV. | 126 |
| Do. (continued) .. .. .. | ,, | XXVa. | 127 |
| Do. (continued) .. .. .. | ,, | XXVb. | 128 |
| Do. (continued) .. .. .. | , | XXVc. | 129 |
| Grinding Milling .. .. .. .. .. | ,, | XXVI. | 130 |
| Modified Rees River Process .. .. .. | ,, | XXVII. | 131 |
| Washoe Process .. .. .. .. .. | ,, | XXVIII. | 132 |
| Roasting Milling .. .. .. .. .. | ,, | XXIX. | 133 |
| Do. (continued) .. .. .. | ,, | XXIXa. | 134 |
| Silver Tailings Mill .. .. .. .. .. | ,, | XXX. | 135 |
| Patio Process.. .. .. .. .. .. | ,, | XXXI. | 136 |
| Smelting .. .. .. .. .. .. | ,, | XXXII. | 137 |
| Comparative Statement of Ore Crushed Monthly, Assay Value Extraction, etc., | ,, | XXXIII. | 138 |
| Results by Different Processes .. .. .. | ,, | XXXIV. | 139 |
| Mill Amalgamation Results .. .. .. | ,, | XXXIVa. | 140 |
| General Summary of Results .. .. .. | ,, | XXXV. | 141 |
| Suggestions to Mine Owners and Purchasers .. .. .. .. | | | 142-144 |
| Useful Memoranda .. .. .. .. .. .. .. .. | | | 145-163 |
| English and French Weights and Measures .. .. .. | | | 145-146 |
| Money of Different Countries .. .. .. .. .. | | | 146-147 |
| Mexican Weights .. .. .. .. .. .. .. | | | 147 |
| General Measures (Conversion Factors).. .. .. .. | | | 147-148 |
| Surveying .. .. .. .. .. .. .. .. | | | 148 |
| Water Power .. .. .. . .. .. .. .. | | | 148 |
| Hydraulics .. .. .. .. .. .. .. .. | | | 149 |
| Rainfall .. .. .. .. .. .. .. .. .. | | | 149 |
| Timber .. .. .. .. .. .. .. .. .. | | | 149 |
| Thermometer Scales .. .. .. .. .. .. .. | | | 149 |
| Aneroid Measurement .. .. .. .. .. .. | | | 149 |
| Standards and Definitions (The Institution of Mining and Metallurgy)— | | | |
| "Ore in Sight".. .. .. .. .. .. .. .. | | | 150 |
| "Mesh of Wire Cloth" .. .. .. .. .. .. | | | 151 |
| "Weights and Measures" .. .. .. .. .. .. | | | 152 |
| Specifications of Standard Boilers .. .. .. .. .. | | | 153 |
| Evaporative Power of Double and Single Flued Steam Boilers .. .. .. .. .. .. .. .. | | | 154 |
| Valuation of Mining Shares of Producing Companies .. | | | 155 |
| Tons per Claim .. .. .. .. .. .. .. .. | | | 156 |
| Dip Chart .. .. .. .. .. .. .. .. | | | 157 |
| Horse-Power for Hoisting .. .. .. .. .. .. | | | 158 |
| Useful Books and Bulletins for Reference .. .. .. | | | 159-162 |
| General Notes (Blank-pages for entering up) .. .. .. | | | 163 |

# SKELETON MINING REPORT.

*Address*.....

*Date*.....

## *REPORT ON THE*

.....MINE OR GROUP OF MINES.

.....

.....

BY .....

.....

## INSTRUCTIONS.

FILL IN ON OPPOSITE PAGE.—(1) Address of Writer;

(2) Date of Report;

(3) Name and Address of person on whose behalf the Report is made.

(4) Names of separate Claims or Leases which comprise the property.

(5) Designation of Group of Claims, or Leases, collectively.

*Address* .....

.....

*To* .....

*Date* .....

*Sir,*

*I beg to hand you the following Report upon the* .....

.....

.....

.....

*known as the* .....

**INSTRUCTIONS pp. 2 & 3.** Refer to Question No. 217A for "Placer" claims.

**Give the name, length, width and total area of the Property, specifying the size of each Claim or Lease.**

NOTES.—A Lode Claim properly located is most frequently a parallelogram or square; but may be and often is irregular in shape.

In the United States a *full* "Lode Claim" is 1,500 × 600 feet, (about 20·7 acres) = 900,000 sq. feet.
In Rhodesia a "Reef Claim" is ... ... 150 × 600 feet ... ... = 90,000 „
In Rhodesia the maximum number of claims allowed in one block is 10, together measuring 1,500 × 600 ft.

} In these Countries a lode "outcropping" within a Lease or Claim can be followed on all its spurs, dips and angles to any depth.

In British Columbia a metalliferous "Claim" is 1,500 × 1,500 feet ... ... = 2,250,000 sq. feet.
In the Transvaal a "Reef Claim" is... 150 × 400 "Cape" feet (154·95 × 413·2 ft.) = 64,025 sq. feet.
It is proposed under the new law that a Prospector shall be able to locate 50 of these.*
In W. Australia an ordinary (gold) quartz claim is 75 × 390 feet ... ... = 29,250 „

} A Lode "outcropping" within a Lease or Claim cannot be followed outside the limits of its surface boundary lines.

South of the Tropic of Capricorn not more than 8 of such claims can be worked in one block.
North of the Tropic of Capricorn the length of claim (measured along the "line of reef," *i.e.*, the "base line") is increased from 75 to 150 ft.
A prospecting area varies from 150 × 150 yards up to 400 × 400 yards according to distance from existing workings.
In New S. Wales an ordinary "Reef Claim" is 60 × 400 ft. = 24,000 sq. ft.; not more than 8 of such claims may be taken up conjointly.
In Queensland „ „ 50 × 400 ft. = 20,000 „ „ „ 10 „ „ „ „
In Victoria the size of a "Claim" depends upon the regulations of the Mining Board of each District.
An acre contains 43,560 sq. feet. A square mile contains 640 acres. A hectare = 2·471 acres = ·003861 sq. mile.

Boundaries of claims should be so pegged or marked that they can be easily located by a surveyor; the distance and bearing (direction) from one corner, to a permanent or fixed landmark being recorded on a plan drawn to scale, dated, with the true North and Magnetic North shown, and the name of the surveyor given.

† "The Law of the Apex" as it is termed in the United States has given rise to endless litigation.
* The gold law of the Transvaal is now being modified, and this is one of the *proposals*.
"The Mining Laws of the British Empire," by C. J. Alford, furnishes information about size of leases and regulations in different countries; and "Mining, Mineral and Geological Law," by Chas. H. Schamel, is a useful work of reference.

## NAMES OF CLAIMS OR LEASES, AREA, AND DATE OF LOCATION.

*The* ..... *is* ..... †*metres* / *feet* } *long by* ..... †*metres* / *feet* } *wide, located* ..... 19 ....

*The* ..... *is* ..... *metres* / *feet* } *long by* ..... *metres* / *feet* } *wide, located* ..... 19 ....

*The* ..... *is* ..... *metres* / *feet* } *long by* ..... *metres* / *feet* } *wide, located* ..... 19 ....

*The* ..... *is* ..... *metres* / *feet* } *long by* ..... *metres* / *feet* } *wide, located* ..... 19 ....

*The* ..... *is* ..... *metres* / *feet* } *long by* ..... *metres* / *feet* } *wide, located* ..... 19 ....

*The* ..... *is* ..... *metres* / *feet* } *long by* ..... *metres* / *feet* } *wide, located* ..... 19 ....

*The* ..... *is* ..... *metres* / *feet* } *long by* ..... *metres* / *feet* } *wide, located* ..... 19 ....

*Total area of the property about* ..... *acres or hectares.*†

*Area of mill site* .....

*Area of Placer Claims*

† NOTE.—One of these to be struck out.

**Always obtain a copy of the Mining Laws and Regulations of the country you are visiting; if new to you.**

## DESCRIPTION OF CLAIMS OR LEASES.

*The* ..... { *Lease or* / *Claim* } *starts from the* ..... *boundary peg of* ..... { *metres* / *or feet* } *in length and bears*

*The* ..... { *Lease or* / *Claim* } *starts from the* ..... *boundary peg of* ..... { *metres* / *or feet* } *in length and bears*

*The* ..... { *Lease or* / *Claim* } *starts from the* ..... *boundary peg of* ..... { *metres* / *or feet* } *in length and bears*

*The* ..... { *Lease or* / *Claim* } *starts from the* ..... *boundary peg of* ..... { *metres* / *or feet* } *in length and bears*

*The* ..... { *Lease or* / *Claim* } *starts from the* ..... *boundary peg of* ..... { *metres* / *or feet* } *in length and bears*

*The* ..... { *Lease or* / *Claim* } *starts from the* ..... *boundary peg of* ..... { *metres* / *or feet* } *in length and bears*

*The* ..... { *Lease or* / *Claim* } *starts from the* ..... *boundary peg of* ..... { *metres* / *or feet* } *in length and bears*

## REMARKS.

In the United States, good title to the veins developed within the "end" and "side-lines," is not always covered by good title to the claim; care must be taken to ascertain, if developments allow of doing so, that the veins outcrop within its "side-lines," and pass through its "end-lines," to insure "extra-lateral rights" on the extension of the lodes in depth. A mill site is not "patentable" if any lodes are known to exist within its boundaries, and the same is true of "placer-claims." A mill site cannot be located on mineral land; but if such claims are located and "patented" in good faith, according to law, and mineral veins are afterwards discovered, the owner's title remains good.

The laws of different States differ, and may materially affect the title, so it is important to study them carefully. If the expense is warranted, an official abstract of title to the properties should be procured, and form part of the report.

**INSTRUCTIONS p. 4.** Refer to Questions No. 104, 107, and 215.

Fill in name of the property and the mining district or gold field as well as the name of the state, territory, province, colony or county in which it is situated; and the distance from and name of the nearest railway station; also position, distance from and name of nearest seaport and important town, and the means of communication with it; so that the exact location of the mine can be found on any good map of the district.

## GEOGRAPHY.

*This Property, known as the* :—..... *is situated*

.....

..... *and is*

*distant* ..... { †*kilometres* / *miles in a* ..... *direction from*

..... *the nearest Railway Station.*

*The nearest important* { †*Village* / *Town* / *Seaport* ..... *is distant* ..... { †*kilometres* / *miles in a*

..... *direction, and is reached by* .....

..... *over* .....

.....

† NOTE.—One of these to be struck out.

**INSTRUCTIONS p. 5.** Refer to Questions Nos. 40, 177, 189, 190, 204, and 211.

Give history of previous working of the property and the names and history of any important neighbouring Mines as far as possible up to date; more especially as regards—

(1) Quantity of stone crushed.
(2) Value of the ore, and how treated.†
(3) Profits or losses.
(4) The first Claims located and worked.
(5) Changes that may have taken place in the character of the ores from surface in depth.

NOTE.—Such information can generally be gleaned from prospectors, local newspapers and official reports, or Government records.

Historical information in regard to every mining district is worth collecting. Early mining failures do not necessarily detract from the merits of an old "field," and if frankly told often lead to an investigation, which shows how they can be overcome.

† This latter is very important, as extraction and cost may be much modified by the introduction of new processes.

# HISTORY OF PROPERTY.

## HISTORY OF PROPERTY.—*continued.*

**HISTORY OF PROPERTY.**—*continued.*

**INSTRUCTIONS p. 6.** Refer to Questions 55 and 56.

Fill in Form on opposite page.

It often happens that a mining camp is reached partly by rail or main road and partly by "trail" or "bush-track," in which case the lengths of the various sections should be given. The elevation can be roughly ascertained by aneroid measurement.

The blank lines at the bottom of the opposite page are to be filled in with particulars of the condition of the roads, estimates of the cost of making new or improving existing ones; and constructing cable or tram-lines on the property itself.

If there are several alternative routes to the mine, compare them with one another, and furnish full particulars of each.

Estimates of cost of constructing new roads, or repairing old ones may be requisite or useful.

## ACCESSIBILITY.

*From* ..... *Station on the* .....

..... *Railroad this property is reached over* .....

{ †*kilometres* / *miles of* } ..... *road, and* { †*kilometres* / *miles of* } .....

*a total of* ..... { †*kilometres* / *miles* } *from the railway station or Seaport of* ..... ; ..... { †*kilometres* / *miles* } *from the mine.*

*The elevation of the Mine is* ..... { †*metres* / *feet* } *higher than* .....

*and* ..... { †*Metres* / *feet* } *above sea level.* *Size of packages that can be conveniently transported* = .....
*Weight of* ,, ,, ,, ,, = .....

*Transport usually is by* ..... *and costs* ..... *per cwt., and takes* ..... *days from* .....

*Station or Seaport of* ..... *to the mine.* *From the mine it costs* ..... *per cwt. to* ..... *and takes* ..... *days.*

.....

† NOTE.—One of these to be struck out.

**INSTRUCTIONS p. 7.** Refer to Questions Nos. 213 and 214.

It should be ascertained whether there is any dispute for the possession of the property, or litigation pending; also whether there is any debt or incumbrance against the property. These can generally be found by consulting Government Official records, and the authority for this information should be stated.

## TITLES.

*Title to the whole or* ..... *of the property is vested by* {†location, lease, or patent,} *in* ..... *the owners who have conveyed their rights by power of attorney or* ..... *to* .....

*Resident at* .....

*There is* ..... *dispute or counter claim to the present owners' possession.*

*There is* ..... *indebtedness or incumbrance against the property* ..... *due.*

*This page is filled in on information obtained from* .....

† NOTE.—Two of these to be struck out.

**INSTRUCTIONS p. 8.** Refer to Questions Nos. 2–36, 109, 118 and 217 E, F, G, H.

The most developed vein of the group should be described on this page by filling up the blank spaces with the information called for. If more than one vein has been "opened up" similar information for each vein should be interpolated, and several pages are left blank to be filled in with a description of the peculiar characteristics of the vein, or such other information concerning it as may be of importance.

## GENERAL CHARACTERISTICS OF LODES OR MINERAL DEPOSITS.

*The* ..... *Vein has the following characteristics:*

*Strike* .....

*Dip* ..... *degrees from horizontal:*

*Width varying from* ..... { †*metres*; *feet*;

*Outcrop* ..... *traceable for a distance of* ..... { †*metres*; *feet*;

*Hanging wall* .....

*Foot wall* .....

*Vein filling* .....

*Oxidised ore extends down about* ..... { †*metres* / *feet* at

| | No. 1. | No. 2. | No. 3. |
|---|---|---|---|
| *Average width of pay ore* ..... *Length of ore shoots* ..... | | | |

*Average width of any specially rich "make of ore"* ..... *Developed at the* ..... { †*metre* / *foot* *level.*

†NOTE.—One of these to be struck out.

DETAILS OF VEIN.

**INSTRUCTIONS p. 9.** Refer to Questions Nos. 52 and 215. (See also Questions on previous page).

The nature of the country rocks enclosing the vein on the "foot" and "hanging-wall" sides should be stated, and the character, course, dip, and throw of the "dykes," if any, that occur in the neighbour of the veins should be given here. Also the general geological and topographical features of the neighbourhood, and any local peculiarities in the geology of the district, that have been found by experience to favourably affect the value of the ore deposits or the reverse; and the names of any rivers or creeks near the mine.

NOTE.—The time spent on studying the formation of the veins and the dyke system in the neighbourhood (if there is one) is well repaid; as a knowledge of the geology of the country often supplies the key which leads the possessor to discover the "bonanza" ore-bodies of the district.

## GEOLOGY.

*The "country rock" on the hanging wall of the ..... Vein is:* .....

.....

*On the footwall it is* .....

..... *dykes of* ..... *occur.*

*The geological "formation" of the district is composed of* .....

*The district is drained by* ..... *creeks, tributaries of the* ..... *river.*

**INSTRUCTIONS p. 10.** Refer to Questions Nos. 37-49, 83-84, 191-192, 210, 211, and 217 B, C, D.

The number and size of the shafts, drives, rises, winzes, and open cuts by which the veins on each property are developed, should be entered under this heading, and the extra blank pages filled in, if one is insufficient to cover them all.

**It is very important** that all development work should be accurately measured and located with reference to a fixed point on a lease or claim, such as a main shaft; and the position of the vein, depth of levels from "collar" of shaft, etc., should be shown on the accompanying plan, page 23.

The numbers of the various open cuts, etc., will be found by reference to the plans and sections on page 23 and following.

State what the "ton" used represents in lb.

# DEVELOPMENTS.

*On the* | No. 1 (size). | No. 2 (size). | No. 3 (size). | No. 4 (size). | **Lease: Claim there are:* No 5 (size).

*Shaft (vertical or underlie)* ..... **metres / feet deep.*

*Open Cuts and Crosscuts*..... No. 1. | No. 2. | No. 3. | No. 4. **metres / feet in length.*

*Tunnels or Adits*..... No. 1. | No. 2. | No. 3. | No. 4. **metres / feet in length.*

*Drives*..... No. 1. | No. 2. | No. 3. | No. 4. | No. 5. **metres / feet in length.*

*Rises*..... No. 1 (size). | No. 2. | No. 3. | No. 4. | No. 5. **metres / feet in height.*

*Winzes*..... No. 1. | No. 2. | No. 3. | No. 4. | No. 5. **metres / feet in depth.*

*Stopes*..... No.....Level No..... | No.....Level No..... | No.....Level No..... | No.....Level No..... | No.....Level No.....

*From the whole Mine* ..... *tons, i.e., from Levels, etc., and* ..... *Stopes* { No.....Level No..... / No.....Level No..... / No.....Level No..... / No.....Level No..... / No.....Level No..... / No.....Level No..... } { **cubic metres / cubic feet / cubic fathoms / tons† / square feet / square metres / square fathoms* } *have been removed*

*Total "development work" done* ..... *feet* { **last year / up to date*

* Strike out those not required.
† Calculated at ..... lb.

# DEVELOPMENTS.

**INSTRUCTIONS p. 11.** Refer to Questions Nos. 47, 48, 80, 81, 149, 170, 171 and 176.

The quantity, quality and cost of all the mining supplies likely to be needed in future operations ought to be ascertained, and such information should be carefully and correctly given, as it is of the utmost importance for close estimates to have such data to figure on.

TIMBER DATA.

To find solidity of Round Timber—

When all dimensions are in feet: length × (¼ mean girth)$^2$ = cubic feet.

When length in feet, girth in inches: length × (¼ mean girth) ÷ 144 = cubic feet.

When all dimensions are in inches: length × (¼ mean girth)$^2$ ÷ 1,728 = cubic feet.

To find solidity of Square Timber—

When all dimensions are in feet: length × breadth × depth = cubic feet.

When one dimension is in inches: length × breadth × depth ÷ 12 = cubic feet.

When two dimensions are in inches: length × breadth × depth ÷ 144 = cubic feet.

"Board measure," depth always = 1 inch.

## MINING FACILITIES.

*FUEL.—There is a* ..... *supply of* ..... *Timber.*

*Cordwood costs* ..... per { †*ton* / ‡*cord* } *delivered at the Mine.*

*Coal costs* ..... „ *ton* „ „ „

*Charcoal costs* ..... „ ** bushel* „ „ „

*Coke costs* ..... „ { †*ton* / *bushel* } „ „ „

*Petroleum (crude) costs* „ *gallon* „ „ „

*Peat (dry) costs* ..... „ *ton* „ „ „

*MINING TIMBER AND LUMBER.—Timber for stull and tunnel-sets ranging from* ..... *to* { †*centimetres* / *inches* }

*in diameter can be delivered at the Mine at a cost of from* ..... *to* ..... *per running* { †*metre.* / *foot.* }

*Lagging poles cost* ..... *per length of* { †*metre.* / *feet* } *Lumber costs* ..... *per* { †*cubic foot* / *or metre* } *thousand at* .....

† One of these to be struck out, and it should be stated whether the "ton" is the English (2,240 lb.), American (2,000 lb.), or Metric ton (2,204·62 lb.)
* One bushel = 8 British gallons = 4 pecks = 1·284 cub. feet. U. S. = 1·032 British, *i.e.*, add. approx. 1-30th. ‡ A pile of wood 4 feet × 4 feet × 8 feet long.

**INSTRUCTIONS p. 12.** Refer to Questions Nos. 63, 92-96, 106, 133 (15), (18), (27), 173-175, and 217 o, q, x, y, z.

The character, quality and quantity of water available for steam and domestic purposes, and the distance of the supply from the Mine should be given.

In some instances water power can be *directly* applied; but in most cases it involves electric generation and transmission, sometimes for very long distances. This raises the question of the class of (water) motor; whether high or low pressure; the type of "current," whether "direct" or "alternating"; and various considerations referring to the cables, rights of way, crossing public roads, protection from lightning, interference by forest growth and by animals.

If there is any water available for power purposes, within reasonable distance of the Mine, its flow in cubic feet per minute and the fall obtainable at a good Mill site, length of pipe, ditch or flume necessary, and cost of constructing the same per yard, should be given.

For calculating the amount of water flowing in an open stream, the following method will be found sufficiently accurate:—

Find the height of head. Measure the depth of water at from six to twelve points across the stream at equal distances apart, add all the depths in feet together, and divide by the number of measurements taken. This gives the average depth of the stream, which, multiplied by its width, gives its area in cross-section; multiply this by its velocity of flow in feet per minute, and you get the cubic feet discharged. The velocity may be found by laying off 100 feet along the bank, throwing a float into the middle and noting the time it takes to be carried down, striking the average of a number of trials. Dividing the distance traversed by the number of minutes taken, gives the surface velocity in feet per minute. As the flow at surface is more rapid than at the bottom and sides, the difference being about 8 feet per cent., it is better to measure a distance of 120 feet for the float, reckoning it as 100.

These measurements should be made at a season when the stream is low.

Weir measurement $\cdot 4\ h\sqrt{h}$. = cubic feet per minute per 1 in. of width of weir.

See Recommendations the Inst. of Mining and Metallurgy, "Weights and Measures," Bulletin No. 38, under "Useful Memoranda" at end of this book.

*WATER.*

*FOR DOMESTIC PURPOSES there is* ..... *water within* ..... *of the mine.*

*FOR STEAM PURPOSES there is* ..... *water within* ..... *of the mine.*

*FOR POWER PURPOSES* * *there is a flow of* ..... { † *cubic metres* / *cubic feet* } *of water within* ..... *of the mine, with a fall of* ..... { † *metres* / *feet* } *at a suitable site for a plant, by conveying it by a* ..... *or* ..... { † *metres* / *feet* } *in length.*

*Such a* { ‡ *flume* / *ditch* / *pipe-line* } *could be built for* ..... *per* { ‡ *metre.* / *foot.* / *rod.* }

*WATER IN MINE*—(1) *If the mine is full, the quantity to be dealt with* = ..... (2) *The amount of water the mine is making per hour* = ..... (3) *The depth from which it is to be raised* = .....

(4) *An analysis (if obtainable) shows* .....

---

* See "Useful Memoranda." † One to be struck out. ‡ Two to be struck out.

**INSTRUCTIONS p. 13 to 14.** Refer to Questions Nos. 71-79, 185, 197, 199, and 217 AA.

Prices at the nearest large town (giving its name) and the railway and other freight to the Mine are to be entered here. Also whether farm-produce is raised in abundance or otherwise, in the neighbourhood of the property. In the tropics, quote price of rice, fish, tapioca, bananas, etc., for natives. Also give *average* daily or weekly cost of living, rent and firing, for European families; and weekly board for unmarried men.

NOTE.—This information should be given with care and as much accuracy as possible, as cost of living is an important factor in operating a Mine.

*SUPPLIES.*

*Hardware, &c., can be purchased at* . *at the following prices, with freight costing*.....*per lb. added.*

*Farm Produce.—Hay costs*..... .....*per ton.* *Oats or Corn costs*..... .....*per bushel.*

| | | | | |
|---|---|---|---|---|
| *Flour costs from* | | | *to* .. .... .... | *per lb.* |
| *Tea* | „ | ..... | „ ..... | „ |
| *Butter* | „ | . .. ... ... | „ ..... | „ |
| *Sugar* | „ | . | „ ..... ..... | „ |
| *Salt* | „ | | „ ... ..... ... . | „ |
| *Potatoes* | „ | . . . . | „ | „ |
| *Beef* | „ | . ..... ..... .. ... | „ | „ |
| *Mutton* | „ | .. . | „ .. .... ... ..... . ..... | „ |
| *Bacon* | „ | ... ... . | „ ..... . ... ..... ..... .. | „ |
| *Canned Goods* | „ | ..... ..... .. .. ... ..... | „ .. ..... ..... | „ |
| *Jam* | „ | ..... .. .. ..... .... . | „ .. .... . ... ..... . . | *per doz.* |
| *Eggs* | „ | ..... ..... .... ... ... .. | „ .... . ... .. .. | „ |
| *Water* | „ | . .. .. | „ | *per* 100 *gallons.* |
| *Beer and Spirits* | „ | . . . | , | *per qt.* |
| *Matches* | „ | ..... .... ..... ..... | , .. ..... .. ..... | *per doz. boxes.* |

## NOTES ON SUPPLIES (Quantities, Duties, Freight-rates, etc.).

### QUANTITIES USED PER FATHOM OR METRE (CONTRACT OR DAY LABOUR).

| | Shafts. | | | | Levels. | | | | Cross-Cuts. | | | | Rises. | | | | Winzes. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Incline. | | Vertical. | | In Country. | | In Ore. | | In Country. | | In Ore. | | In Country. | | In Ore. | | In Country. | | In Ore. | |
| | Hand. | Mach. | Hand. | Mach. | Hand. | Mach. | Hand. | Mach. | Hand. | Mach. | Hand. | Mach. | Hand. | Mach. | Hand. | Mach. | Hand. | Mach. | Hand. | Mach. |
| Explosives ... | | | | | | | | | | | | | | | | | | | | |
| Fuse ... ... | | | | | | | | | | | | | | | | | | | | |
| Detonators ... | | | | | | | | | | | | | | | | | | | | |
| Candles ... ... | | | | | | | | | | | | | | | | | | | | |
| Oil ... ... | | | | | | | | | | | | | | | | | | | | |
| Sundries... ... | | | | | | | | | | | | | | | | | | | | |
| Timbering ... | | | | | | | | | | | | | | | | | | | | |

Tons trucked per man per shift { A. from "faces" = / B. „ "passes" = }

Tons hoisted per "pare" in winzes =

DUTIES:

FREIGHT-RATES:

## MINING SUPPLIES. (Note.—Prices may be given per kilo, metre, etc.).

| | Price per case | Price per lb. |
|---|---|---|
| *Dynamite* ... ... | | |
| *Gelignite* ... ... | | |
| *Blasting Gelatine* ... | | |
| *Gelatine Dynamite* ... | | |
| *Blasting Powder per keg* | | |
| *Fuse* ... ... *per 100 coils* | | |
| *Detonators* ... *per 1000* | | |
| *Candles* ... *per 25 lb. box* | | |
| *Oil (Colza)* ... *per gallon* | | |

| | Price |
|---|---|
| *Oregon Pine, per 100 sup. ft.* | |
| *T. & G. Pine* ,, | |
| *Slabs* ... ... ... ... | |
| *Cement* ... ... *per cwt.* | |
| *Galvanized Iron, per sq. foot* | |
| *Shovels* ... ... *per doz.* | |
| *Hammers* ... ... *per lb.* | |
| **Drill Steel (octagon)* ... ,, | |
| *Oil (Kerosene) per gallon* | |

| | Price |
|---|---|
| *Bar Iron, square* ... *per lb.* | |
| *Round* ,, ... ... ,, | |
| *Flat* ,, ... ... ,, | |
| *Rails* ,, ... ... | |
| *Nails (8 in. wire) per 100 lb.* | |
| *Mercury* ... ... *per flask* | |
| *Cyanide* ... ... *per lb.* | |
| *Fluxes for Smelters per ton* | |

## WEIGHT OF TIMBER.

Green Timber usually weighs ¼ to ⅓ more than dry, and tolerably seasoned ordinary building Timber ⅛ more than dry. For tables of scantlings of joists, rafters, etc., for roofs of different span, made of "Baltic Pine," see tables "Tredgold's Carpentry," revised by J. T. Hurst. Pine, perfectly dry, weighs about 1860 lb. per 1000 feet B.M.

* When ordering ordinary Steel in bar it is most important to state the purpose for which it is to be used, as it is sold in various qualities. Steel should never be overheated as it becomes coarse grained and loses its natural silky texture.

Note.—"Instructions face page 13."

**INSTRUCTIONS p. 15.** Refer to Questions Nos. 48, 66, 82, 98, 102, 133 (32), 148, 149, 152-154, 166, 169, and 184, 186, 217 T, and Table facing Page 14, in connection with Contract work.

The cost of labour is one of the largest items entering into the calculations of profit or loss of a mining enterprise, and should be set down fully and correctly. Costs increase with depth of working.

**STAFF.**

General Manager's Salary = £ per annum.
... Assistant " " = " "
Surveyor's " = " "
Metallurgist's " = " "
Assayer's " = " "
Accountant's " = " "
Clerk's " = " "

Average number of "points" sharpened by blacksmith = and cost per "point" =
Cost of oil or candles per ton stoped = and per foot or metre in "development" =
Number of shifts per 24 hours = Shifts worked =

What sizes of steel are used in drilling? { By "hand" / By "machine" }
What sizes of cartridges are used? { In "hand-drilling" / In "machine-drilling" }

*Cubic feet, metres or tons stoped per man per shift* { A By "hand." / B By "machine." }
*Depth of holes drilled per man per shift* { A By "hand." / B By "machine." }

*Stoping costs* ..... *per cubic* †*fathom or metre, or ton* { A By "hand." / B By "machine." }
*Drilling costs* *per* **foot or metre* { A By "hand." / B By "machine." }

† Two to be struck out. * One to be struck out.

# LABOUR.

*Mine Manager's salaries range from* ..... *to* .....
*Shift Bosses' wages range from* ..... *to* .....
*Pitmen's* ,, ,, ..... *to* .....
*Timber Men's* ,, ,, ..... *to* .....

| | Dry ground | Wet ground |
|---|---|---|
| *Miners' daily wages range from* | | *to* |
| *Drill Men's* ,, ,, | | *to* |
| *Helpers* ,, ,, | | *to* |
| *Truckers'* ,, ,, | | *to* |
| ,, *from shoots* ,, ,, | | *to* |

*Mill Manager's salary ranges from* ..... *to* .....
*Amalgamators' daily wages range from* ..... *to* .....
*Mill Hands'* ,, ,, ..... *to* .....

*Cyanide Men's daily wages range from* ..... *to* .....
*Stone Breakers', Feeders' and Boys' daily wages range from* ..... *to* .....
*Carpenters' daily wages range from* ..... *to* .....
*Blacksmiths* ,, ,, ..... *to* .....
*Blacksmiths' help* ,, ,, ..... *to* .....
*Machinists'* ,, ,, ..... *to* .....
*Engine Drivers* ,, ,, ..... *to* .....
*Native Labour costs* ,, ,, ..... *to* .....
,, *Miners* ,, ,, ..... *to* .....
,, *Mill Hands* ,, ,, ..... *to* .....
*Smelters* ,, ,, ..... *to* .....
*Furnacemen* ,, ,, ..... *to* .....

*Four-horse Teams and Teamster Wages range from* ..... *to* .....

# CONTRACT WORK.

| | **Day labour or* | †*per foot, fathom or metre.* | Average Progress per Month. *Feet.* A | *Feet.* B | *Fathoms.* A | *Fathoms.* B | *Metres.* A | *Metres.* B |
|---|---|---|---|---|---|---|---|---|
| *Incline Shaft on Vein* | *in the clear, can be sunk on Contract for* | ,, ,, | | | | | | |
| *Vertical Shaft* | ,, ,, ,, ,, | ,, ,, | | | | | | |
| *Cross-cut Tunnels* (*in ore*) | *in the clear, can be run on Contract for* | ,, ,, | | | | | | |
| *Cross-cut Tunnels* (*in "country"*) | | | | | | | | |
| *Drives* (*in ore*) | ,, ,, ,, ,, | ,, ,, | | | | | | |
| *Drives* (*in "country"*) | | | | | | | | |
| *Rises* (*Vertical on Vein*) | ,, ,, ,, ,, | ,, ,, | | | | | | |
| *Winzes* (*Vertical on Vein*) | ,, ,, ,, ,, | ,, ,, | | | | | | |

Two to be struck out. * One to be struck out. A By "hand." B By "machine."

**INSTRUCTIONS p. 16.** Refer to Questions Nos. †5-10, 40-43, 45, 46, 51, 53, 54, 109, 118, 193.

The value of assays, and even of milling-tests on a larger scale, entirely depends on the *accuracy* of the *sampling*, which is largely governed by the method employed. In this connection the following papers may be consulted for information.

(1) Sampling Ores Without Machinery, vol. xx., p. 155, Trans. American Institute of Mining Engineers.
(2) Important Points in sampling, vol. lii., p. 264, *The Eng. and Min. Journal*, Sept. 15th, 1891.
(3) Notes on Sampling, vol. liv., p. 156, *The Eng. and Min. Journal*, August 13th, 1892.
(4) The Sampling and Measurement of Ore-bodies in Mine Examinations, vol. 59, *The Eng. and Min. Journal*, March 2nd, 9th and 16th, 1895.
(5) Mine-Salting, by W. McDermott, vol. iii., *Trans. Inst. of Mining and Metallurgy*.
(6) A Graphic Method Applied to Delineating Ore bodies with Notes on Sampling and Estimating Ore-reserves, by A. G. Charleton, vol. ix., *Trans. Inst. of Mining and Metallurgy*.
(7) "Ore in Sight," by J. D. Kendall, *Trans. Inst. of Mining and Metallurgy*, vol. x.
(8) "Ore in Sight," by A. W. Warwick, *The Industrial Printing and Publishing Co., Denver, Colorado*, 1903.
(9) Estimating and Sampling Ore Reserves, as practised on the Witwatersrand, by Wilfred Wybergh, *Trans. Inst. of Mining and Metallurgy*, 1896.

In calculating the tonnage and value of ore "in sight"* for a conservative estimate, it is generally necessary that *three* sides of the ore body should be exposed by the developments, but this is not always absolutely required. If the vein is regular, an "ore-shoot" opened up by several levels may admit of close calculation as to tonnage and value. Two sides of an ore body may be sufficient for this calculation, allowing a certain proportion, say one-third off, if the "ore-shoot" is irregular. The extent of the developments by which this ore is placed in sight should be fully stated. The average length, breadth and thickness of an ore body in feet multiplied by each other will give its cubic contents in feet. Cubic feet divided by 9 to 12 for a sulphide ore, and 13 to 18 for an oxidised ore, give the approximate tonnage (long) *in place*. In dumps 20 to 25 cubic feet of oxidised ore and 15 to 18 of sulphide should be allowed per ton. For further information refer to "papers" above named. About 30 cubic feet of "tailings" may generally be reckoned to the ton. With ore "in place" an allowance must be made for moisture of 7% to 10%, and for crevices etc.

† See also under "Instructions" p. 10.

* The limitation of this term and "ore probable" are defined by the Inst. of Mining and Metallurgy Circular, dated Sept. 30th, 1902. See Vol. X., p. 202, given at the end of this book, under "Useful Memoranda."

## ORE TONNAGE "IN SIGHT" AND "PROBABLE ORE."

*In the* ..... { *Mine* / *Claim*

*there are about* ..... *tons of ore "in sight," having an average value of about* .....

*per* ..... * *ton in* ..... ; *and about* ..... * *tons of "ore probable," having* .....

*an average value of about* ..... *per* ..... * *ton in* .....

.....

.....

.....

* State whether 2240 lb., 2000 lb. or "metric" ton.

Books and "Papers" that may be consulted in estimating ore-reserves: "The Witwatersrand Gold Fields," by S. J. Truscott; "Observations on Sampling, etc., applied to Banket Mining in the Transvaal," by G. A. Denny, Trans. Fed. Inst. Min. Engs.; "Valuation of a Witwatersrand Mine," by E. J. Way: "The Computation of Assay Values," by Wm. Crosley, Trans. Inst. of Mining and Metallurgy, 1905; "The Detailed Mapping of Stoping Areas," by H. R. Sleeman, Trans. Inst. of Mining and Metallurgy, 1906; "Method of Obtaining the Volume of Small Drifts and Working Places," by C. S. Herzig, Trans. Am. Inst. Mining Engineers, Vol. XXX.

## ORE TONNAGE "IN SIGHT" AND "PROBABLE ORE"—*continued.*

**ORE TONNAGE "IN SIGHT" AND "PROBABLE ORE"**—*continued.*

## ORE TONNAGE "IN SIGHT" AND "PROBABLE ORE"—*continued.*

**ORE TONNAGE "IN SIGHT" AND "PROBABLE ORE"**—*continued.*

## INSTRUCTIONS p. 17.

The following list will assist the Miner in the foregoing calculations :—

| NAME OF ROCK. | † AVERAGE WEIGHT PER CUBIC FOOT, "IN PLACE." | | | Cubic feet per Long ton. | Cubic feet per Short ton. |
|---|---|---|---|---|---|
| Granite ... ... ... ... ... ... | 164 lb. | to | 172 lb. | 13·5 | 12 |
| Porphyry ... ... ... ... ... ... | 170 lb. | „ | — | 13·5 | 12 |
| Greenstone ... ... ... ... ... | 199 lb. | „ | 218 lb. | 10-11 | 9-10 |
| Limestone ... ... ... ... ... | 100 lb. | , | 200 lb. | 11-22 | 10-20 |
| Slate ... ... ... ... ... ... | 165 lb. | „ | 180 lb. | 12·5-13·5 | 11-12 |
| Shale ... ... ... ... ... ... | 160 lb. | „ | 170 lb. | 13-5 | 12 |
| Quartz ... ... ... ... ... ... | 165 lb. | „ | 170 lb. | 13-5 | 12 |
| Sandstone ... ... ... ... ... | 130 lb. | „ | 160 lb. | 14-17 | 13-15 |

Rocks when broken, compared with the same when solid, may be calculated to increase in volume in the ratio of 1 to 1·5 or 1 to 1·8, the increase being dependent upon the size and shape of the fragments.

A quartz vein 12 inches wide = approximately 2½ tons per square fathom ; a quartz vein 4·6 inches wide = about 1 ton per square fathom. Quartz will weigh about 94 lb. ; Slate 95 lb. ; Limestone, 96 lb. ; Granite, 97 lb., and Greenstone or Trap, 107 lb. per cub. foot *broken*, depending however on size. 18 cub. ft. of earth in bank = 27 cub. ft. of dry and loose earth = 17 cub. ft. of clay = 25 cub. ft. of sand = 1 ton in weight.

† As given by C. G. Warnford-Lock, Miners' Pocket Book, 4th Edition, p. 124.

**INSTRUCTIONS p. 17** (*continued*).

The average width of the ore removed in any area stoped can be computed by dividing the tonnage of ore yielded by the square fathoms of area removed, converting the quotient into lb., and dividing by the weight of the ore in lb. per square fathom, 1 foot in width; reckoning it as 1 inch thick, if the average width is less than 12 inches.

The "stope width" will always be, however, slightly in excess of the actual width of the ore. The calculation of weight from sp. gr., is only, of course, applicable to ore composed of one mineral; or to simple rocks, or their combinations in known proportions.

A safe margin should always be allowed, as the standard sp. gr. given in text-books represents pure, dense, crystallised specimens, whilst in ore deposits the minerals are often more or less altered, amorphous or porous. An allowance of at least 5 per cent. should also generally be made for crevices, cavities, etc.

Mr. Bennett H. Brough gives an example * showing how to find the weight of an ore per square fathom in a composite vein consisting of different minerals.

The question is thus stated:—What quantity of galena will be produced per square fathom from a mineral vein 6 inches wide, ¼ of the vein consisting of galena, the remainder of zinc blende, and $\frac{1}{20}$ being allowed for cavities? The sp. gr. of galena is 7·5, and 1 cubic foot of water weighs 1,000 oz.; therefore, 1 cubic foot of galena weighs 7,500 oz. The vein being 6 inches thick, there are 18 cubic feet in a square fathom; ¼ of that amount, or 4·5 cubic feet, consists of galena. The weight of galena in ounces is, therefore, 7,500 × 4·5 = 33,750 oz., or 2,109·375 lb. From this $\frac{1}{20}$, or 105·468 lb., must be deducted, leaving 2,003·907 lb., or 17 cwt. 3 qr. 15 lb, as the weight of the lead ore per square fathom. The weight of the zinc blende, constituting the remaining three-fourths of the vein, is similarly calculated, deducting $\frac{1}{20}$ for cavities, and taking its sp. gr. as 4·1.

* "Treatise on Mine Surveying," 5th Edition, p. 163.

**INSTRUCTIONS p. 17** (*continued*).

The proportion of each mineral in place must be calculated from the relative percentage the one is shown to bear to the other in the total width taken as "vein-matter" to be "stoped," as determined by analysis, assays, or concentration tests, and the weight of each mineral per square fathom of vein can be ascertained once the percentage of each mineral present in the gangue has been determined.

With complex ores, or in dealing with oxidised ores that are loose, porous and amorphous, as Mr. W. Kirby remarks, it is much safer, however, not to rely on sp. gr., but to calculate the tonnage that a given volume represents, by practical tests, in one of the following ways:—

1. If in a narrow homogeneous band, several tons may be broken down and weighed, after carefully measuring the thickness and area, to determine its volume.

2. In a mass of ore, Mr. Kirby used data obtained by carefully "stoping" out the rectangular prism to be filled by a "square-set" of timbers.

3. The determination can be made on a small scale, by filling a bucket, tub, or box of known capacity with a weighed quantity of coarsely broken ore, and pouring in water level with the top. The water is then poured off, and its volume measured, the difference being the volume of solid ore. Occasional determinations of this kind enable a safe factor to be obtained, the object being not scientific accuracy, but safety. In sampling, "sectional-cuts" should be taken as deep as possible across the vein, and the samples must be carefully caught, and properly "quartered down" for assay.

# WEIGHTS OF METALS AND ORES.

The following table given by Mr. ROBERT HUNT, F.R.S., shows the weight in lb. per cubic foot of various Metals and Ores, to which the Author has added a table of sp. gr. as given in "Tables for the Determination of Minerals," by PERSIFOR FRAZER, and their weight per cubic foot as calculated from these latter figures.

To find the weight of Ore per square fathom in a vein, multiply the figures in the 2nd or 3rd column by the number of cubic feet in a square fathom of the vein at a given thickness. To find the cubic feet, multiply the average thickness of the Ore in inches by 3.

| METALS AND ORES. | Sp. gr. | † Weight lb. per cubic ft. | ‡ Weight lb. per cubic ft. | METALS AND ORES. | Sp. gr. | † Weight lb. per cubic ft. | ‡ Weight lb. per cubic ft. | METALS AND ORES. | Sp. gr. | † Weight lb. per cubic ft. | ‡ Weight lb. per cubic ft. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Silver (native) .. .. | 10·5 | 656·25 | 643·75 | Lead (native) .. .. | 11·37 | 710·62 | 709·37 | Nickel .. .. .. | — | — | — |
| Argentite .. .. | 7·2 | 450·00 | 449·37 | Galena .. .. .. | 7·5 | 468·75 | 468·75 | Kupfer Nickel .. | 7·5 | 468·75 | 450·25 |
| Pyrargyrite .. .. | 5·8 | 362·50 | 362·50 | Cerussite .. .. | 6·4 | 400·00 | 403·75 | Millerite .. . | 5·0 | 312·50 | 281·25 |
| Horn Silver .. .. | 5·4 | 337 50 | 287·50 | Zinc blende .. .. | 4·1 | 256·25 | 250·00 | Cobalt (Cobaltite) .. | 6·0 | 375·00 | 400·00 |
| Copper (native) .. .. | 8·9 | 556·25 | 525·00 | Zincite .. .. .. | 5·5 | 343·75 | 337·50 | Iron (native) .. .. | 7·5 | 468·75 | 456·25 |
| Chalcocite .. .. | 5·7 | 356·25 | 343·75 | Calamine .. .. | 3·16—3·9 | 197·50 | 268·75 | Iron pyrites .. .. | 5·0 | 312 50 | 500·00 |
| Chalco-pyrite .. .. | 4·2 | 262·50 | 259·37 | Antimony (native) .. | 6·6 | 412·50 | 412·50 | Magnetic iron ore .. | 5·0 | 312·50 | 512·50 |
| Bornite .. .. .. | 5·0 | 312·50 | 312·50 | Stibnite .. .. .. | 4·5 | 281·25 | 281·25 | Arsenical pyrites .. | 6·0 | 375·00 | 581·25 |
| Tetrahedrite .. .. | 4·7 | 293·75 | 296·87 | Manganese .. .. | — | — | — | Hæmatite .. .. | 4·8 | 300·00 | 225·00 |
| Cuprite .. .. .. | 6·0 | 375·00 | 375·00 | Pyrolusite .. .. | 4·8 | 300·00 | 300·00 | Silica (quartz) .. | 2·7 | 168·75 | 162·50 |
| Malachite .. .. | 3·8 | 237·50 | 250·00 | Wad .. .. .. | 3·7 | 231·25 | 231·25 | Heavy Spar (Baryta) | 4·3—4·7 | 268·75 | 268·75 |
| Tin Oxide.. .. .. | 6·8 | 425·00 | 406·75 | Psilomelane .. .. | 4·0 | 250·00 | 250·00 | Calc-spar .. .. | 2·6 | 162·50 | 156·25 |
| Tin Sulphide .. .. | 4·4 | 275·00 | 268·75 | | | | | Fluor-spar .. .. | 3·1 | 193·75 | 196·25 |

† NOTE.—Calculated from Sp. gr. in previous column.

‡ NOTE.—Figures given by Dr. HUNT.

**INSTRUCTIONS p. 18.** Refer to Questions Nos. 13-25, 27, 109, 118, and 119; pages 84 and 85, and blank sheets for Analyses, pages 86, 87.

The description of the samples must clearly denote the character of the ore, width of "sample-cut," and the point from which it was taken.

If the vein is wide and carries different grades of ore, samples must be taken of the various classes, and their average value should agree with the value of the general average sample.

Specimens, though they may be characteristic of parts of the vein, do not furnish proper data upon which to calculate the average value of the ore.

| | | | | | |
|---|---|---|---|---|---|
| Gold calculated at | per oz. fine. | Copper ("Standard") | calculated at | | per ton, lb. or unit. |
| Silver ,, ,, | per oz. fine. | Lead | ,, | ,, | ,, ,, |
| ,, ,, ,, | per oz. "Standard." | Zinc | ,, | ,, | ,, ,, |
| | | Tin or other metal | ,, | ,, | ,, ,, |
| | Gross average value | | per ton. | | |

Fine gold, Mint price, per oz., £4 4s. 11·4545d., Bank value, per oz., £4 4s. 9·8182d. = 4s. 2·89d. per dwt.

The value of the "fine gold" in the table opposite may be taken at 85s., or $20·67 U.S. currency; and the price of the silver, copper, lead and zinc, on which the gross value of the ore is based, should be entered in the table above.

## ASSAYS OR PAN TESTS (See Supplementary Table, p. 84).

*Samples taken by* ..... *and*

*assayed by* ..... *ran as follows:—*

| Nos. | DESCRIPTION. | Gold per ton. | Value of "fine gold" per ton. | | Silver per ton. | Copper % | Lead % | Zinc % | Gross value of metallic contents per ton. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | s. | $ | oz. dwt. gr. | | | | s. d. | $ |
| 1 | | | | | | | | | | |
| 2 | | | | | | | | | | |
| 3 | | | | | | | | | | |
| 4 | | | | | | | | | | |
| 5 | | | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |
| 9 | | | | | | | | | | |
| 10 | | | | | | | | | | |
| 11 | | | | | | | | | | |
| 12 | | | | | | | | | | |
| 13 | | | | | | | | | | |

**ASSAYS**—*continued.*

| Nos. | DESCRIPTION. | Gold per ton. | Value of "fine gold" per ton. | | Silver per ton | Copper % | Lead % | Zinc % | Gross value of metallic contents per ton. |
|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | s. | $ | oz. dwt. gr. | | | | s. d. $ |
| 14 | | | | | | | | | |
| 15 | | | | | | | | | |
| 16 | | | | | | | | | |
| 17 | | | | | | | | | |
| 18 | | | | | | | | | |
| 19 | | | | | | | | | |
| 20 | | | | | | | | | |
| 21 | | | | | | | | | |
| 22 | | | | | | | | | |
| 23 | | | | | | | | | |
| 24 | | | | | | | | | |
| 25 | | | | | | | | | |
| 26 | | | | | | | | | |
| 27 | | | | | | | | | |
| 28 | | | | | | | | | |
| 29 | | | | | | | | | |

**ASSAYS**—*continued.*

| Nos. | DESCRIPTION. | Gold per ton. | Value of "fine gold" per ton. | | Silver per ton | Copper % | Lead % | Zinc % | Gross value of metallic contents per ton. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | s. | $ | oz. dwt. gr. | | | | s. d. | $ |
| 30 | | | | | | | | | | |
| 31 | | | | | | | | | | |
| 32 | | | | | | | | | | |
| 33 | | | | | | | | | | |
| 34 | | | | | | | | | | |
| 35 | | | | | | | | | | |
| 36 | | | | | | | | | | |
| 37 | | | | | | | | | | |
| 38 | | | | | | | | | | |
| 39 | | | | | | | | | | |
| 40 | | | | | | | | | | |
| 41 | | | | | | | | | | |
| 42 | | | | | | | | | | |
| 43 | | | | | | | | | | |
| 44 | | | | | | | | | | |
| 45 | | | | | | | | | | |

**ASSAYS**—*continued.*

| Nos. | DESCRIPTION. | Gold per ton. | Value of "fine gold" per ton. | | Silver per ton | Copper % | Lead % | Zinc % | Gross value of metallic contents per ton. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | s. | $ | oz. dwt. gr. | | | | s. d. | $ |
| 46 | | | | | | | | | | |
| 47 | | | | | | | | | | |
| 48 | | | | | | | | | | |
| 49 | | | | | | | | | | |
| 50 | | | | | | | | | | |
| 51 | | | | | | | | | | |
| 52 | | | | | | | | | | |
| 53 | | | | | | | | | | |
| 54 | | | | | | | | | | |
| 55 | | | | | | | | | | |
| 56 | | | | | | | | | | |
| 57 | | | | | | | | | | |
| 58 | | | | | | | | | | |
| 59 | | | | | | | | | | |
| 60 | | | | | | | | | | |
| 61 | | | | | | | | | | |

**ASSAYS**—*continued.*

| Nos. | DESCRIPTION. | Gold per ton. | Value of "fine gold" per ton. | | Silver per ton | Copper % | Lead % | Zinc % | Gross value of metallic contents per ton. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | s. | $ | oz. dwt. gr. | | | | s. d. | $ |
| 62 | | | | | | | | | | |
| 63 | | | | | | | | | | |
| 64 | | | | | | | | | | |
| 65 | | | | | | | | | | |
| 66 | | | | | | | | | | |
| 67 | | | | | | | | | | |
| 68 | | | | | | | | | | |
| 69 | | | | | | | | | | |
| 70 | | | | | | | | | | |
| 71 | | | | | | | | | | |
| 72 | | | | | | | | | | |
| 73 | | | | | | | | | | |
| 74 | | | | | | | | | | |
| 75 | | | | | | | | | | |
| 76 | | | | | | | | | | |
| 77 | | | | | | | | | | |

**ASSAYS**—*continued.*

| Nos. | DESCRIPTION. | Gold per ton. | Value of "fine gold" per ton. | | Silver per ton | Copper % | Lead % | Zinc % | Gross value of metallic contents per ton. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | s. | $ | oz. dwt. gr. | | | | s. d. | $ |
| 78 | | | | | | | | | | |
| 79 | | | | | | | | | | |
| 80 | | | | | | | | | | |
| 81 | | | | | | | | | | |
| 82 | | | | | | | | | | |
| 83 | | | | | | | | | | |
| 84 | | | | | | | | | | |
| 85 | | | | | | | | | | |
| 86 | | | | | | | | | | |
| 87 | | | | | | | | | | |
| 88 | | | | | | | | | | |
| 89 | | | | | | | | | | |
| 90 | | | | | | | | | | |
| 91 | | | | | | | | | | |
| 92 | | | | | | | | | | |
| 93 | | | | | | | | | | |

**ASSAYS**—*continued.*

| Nos. | DESCRIPTION. | Gold per ton. | Value of "fine gold" per ton. | | Silver per ton. | Copper % | Lead % | Zinc % | Gross value of metallic contents per ton. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | oz. dwt. gr. | s. | $ | oz. dwt. gr. | | | | s. d. | $ |
| 94 | | | | | | | | | | |
| 95 | | | | | | | | | | |
| 96 | | | | | | | | | | |
| 97 | | | | | | | | | | |
| 98 | | | | | | | | | | |
| 99 | | | | | | | | | | |
| 100 | | | | | | | | | | |

*Gold calculated at £ ..... per oz.*

*Silver calculated at ..... per oz.*

*Other Metals calculated at* { *Copper* ..... *per unit.* / *Lead* ..... " / *Zinc* ..... "

*General Average oz. dwt. gr. per Ton.*

**INSTRUCTIONS p. 19.** Refer to Questions Nos. 44-46, 54, 103-105, 107-108, 114-117, 120-130, 139, 140, 161-168, 189-192, 206, 217 B, V.

To be filled in from actual Mine and Mill statements, the accuracy of which should be verified from the books of the Company.

## SHIPMENTS AND PROCEEDS.

*There have been* ..... *tons of first-class ore shipped to the* .....

*Works, which netted* ..... *per ton. Also* ..... *tons of second-class ore to the* .....

*Works, which netted* ..... *per ton.*

| | £ | $ s. | cts. d. | |
|---|---|---|---|---|
| †*Estimated cost of Developing this ore* ... ... ... ... ... ... | ..... | | | *per ton.* |
| † „ „ „ *Mining* „ ... ... ... ... ... ... | ..... | | | „ |
| *Cost of Waggon or other transport specified* ... ... ... ... ... | ..... | | | „ |
| *Cost of railway transport* ... ... ... ... ... ... ... ... ... | ..... | | | „ |
| †*Cost of milling or other treatment specified* ... ... ... ... ... | ..... | | | „ |
| †*General Expenses* ... ... ... ... ... ... ... ... ... ... | ..... | | | „ |
| *Total Cost* ... ... ... | | | | „ |

† NOTE.—These should be itemised in the Tables provided for the purpose at the end of this book.

**INSTRUCTIONS p. 20.** Refer to Questions Nos. 120-126, 130-133, 141-144, 150, 152-158, 161-169, 191, and 217 N, X, Y, Z.

The character and cost of the "plant" necessary for dealing with the ores developed, above and below water-level, to be entered opposite.

If the Mine is sufficiently developed the ore reserves may be sampled by milling tests in bulk, when the necessary facilities for doing so can be obtained in the neighbourhood. Having settled upon the method to be employed and the capacity of the proposed "plant," tenders should be obtained from different makers, and their offers should be separately entered on page 20.

The usual particulars required for figuring on tenders for "plant" will be found in the instructions subjoined.

## PARTICULARS REQUIRED FOR PLANT TENDERS.

(1) **Description** of ore to be treated, and, if known, the chemical and mineralogical composition of same.

(2) **Quantity** of ore to be crushed in a given time, usually per diem, stating the length of the working day.

(3) **Saving.** The percentage of *metal or mineral required to be saved*, and the tenor of the concentrates.

(4) **Plans.** Send if possible a general plan of the mill site set out with contour lines, 3 feet apart, vertically, with cross sections and levels, shewing the direction from which the ore arrives, and in which the tailings are to leave the mill.

(5) **Water.** State quantity of clean water available per minute or per hour, and shew on plan the direction in which it arrives and can be discharged from the mill.

(6) **Power.** State whether steam, water or other power is available; its amount; shewing the position of the "water-power" or other source of supply on the general plan.

(7) **Buildings.** State if these are to be all iron; or partly iron and brick; or stone and woodwork.

(8) **Samples.** Send with enquiry, if possible, a small average sample of the crude ore (about 5 cwt.), and later on from 1 to 5 tons of ore to test, before definite plans are made and tenders are accepted.

The returns obtained should be stated in ounces of gold and silver (not ounces of bullion) and units or percentage of metal.

(9) **Remarks.**

## REDUCTION PLANT.

*The Ores of this property are suitable for reduction by the*.....

.....*process. A reduction plant of this character of*..... *tons daily capacity will cost*

*erected and ready to run*.....*Estimated by*.....

*as follows*: .....

.....

.....

.....

.....

**INSTRUCTIONS p. 21.** Refer to Questions Nos. 124-125, 129, 152-154, 168, 176, 182-191, 203-211, and 217 v and DD.

On the supposition that the reduction plant described on page 20 is erected and in operation, the blank form opposite must be filled in. An increase in the quantity milled frequently lowers the average yield per ton previously obtained.

Liberal estimates must be made upon all items for the first year or two, as these generally run higher at first than after the Works have been in operation some time, when everything is properly systematized.

## ESTIMATE OF PROFIT WITH PLANT RECOMMENDED ON PAGE 20.

| | £ | $ s. | cts. d. |
|---|---|---|---|
| ..... tons per day of assay value of ..... per ton - - - | | | |
| | £ | $ s | cts. d. |
| Loss in treatment ..... per cent. - - - - - | | | |
| Cost of Development ..... tons† @ $ £ ..... per ton† - | | | |
| Cost of Mining ..... tons @ $ £ ..... per ton - | | | |
| Cost of Transport of ..... tons @ $ £ ..... per ton - | | | |
| Cost of Reduction of ..... tons @ $ £ ..... per ton - | | | |
| All other items of expense, say - - @ $ £ ..... per ton - | | | |
| Total Cost per diem - | | | |
| Net daily profit - - - - - - - | | | |
| Net profit per year - - - - - - - | | | |

† State whether "long," "short" or "metric" ton.

**INSTRUCTIONS p. 22.**

As it is impossible to frame a form suitable for all conditions under which the owners might be willing to part with their property, the proposition they are prepared to make may be entered on the blank pages that follow. In this connection it is important to know the total amount at which it is proposed to capitalize the property (*i.e.*, the total nominal capital, if it is intended to form it into a Company), and the total "working capital" considered necessary to prove, develop, and place the mine in a producing condition, corresponding with the capacity of the existing or contemplated reduction-works. The owners of *unproductive* mining property should be willing to "bond" such on reasonable terms, or part with an interest in it for shares, to persons who will undertake to find capital for its development.

## TERMS OF SALE.

*The parties* ..... *will sell for* .....

*payable in* ..... *instalments of* ..... *each. First* .....

..... *; second* ..... *months after* .....

.....

*or they will lease or "bond" the* ..... *property for* ..... *under the following conditions:—*

.....

.....

.....

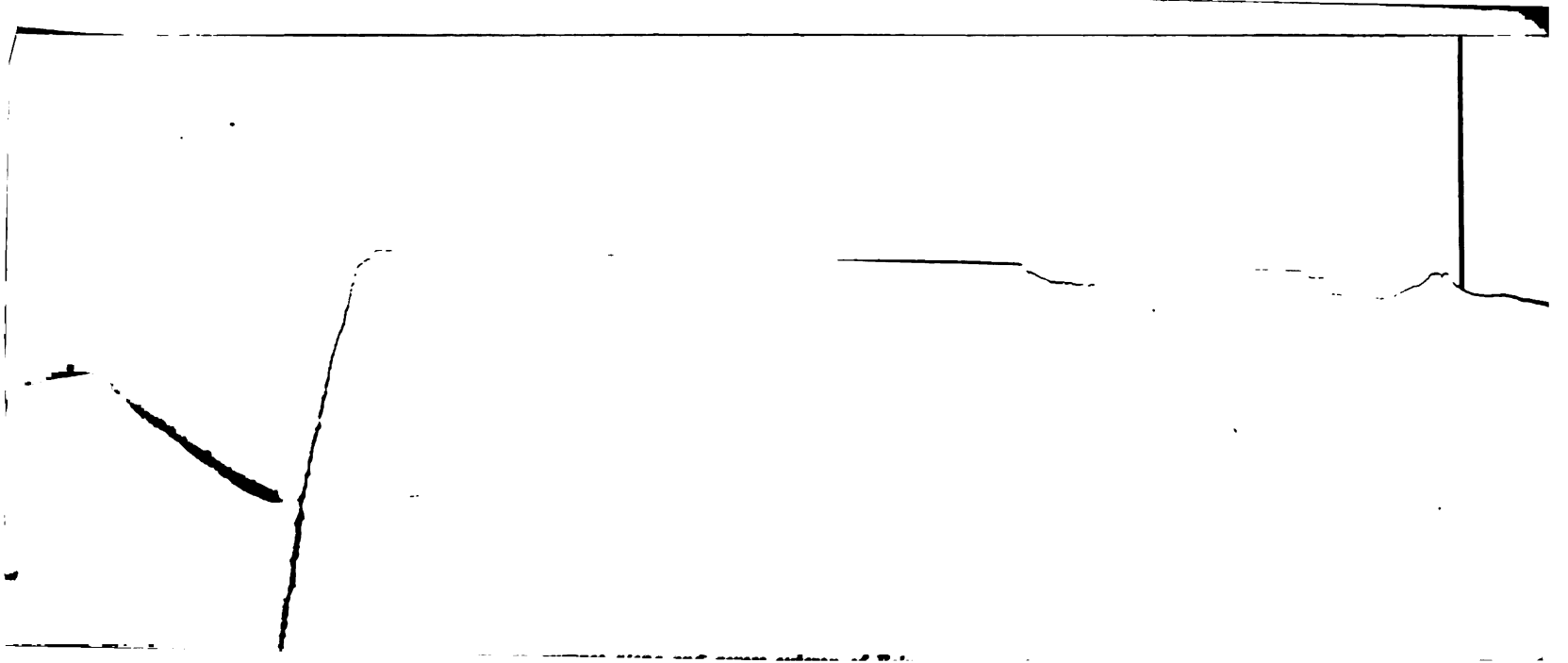
.....

.....

**INSTRUCTIONS p. 23.**

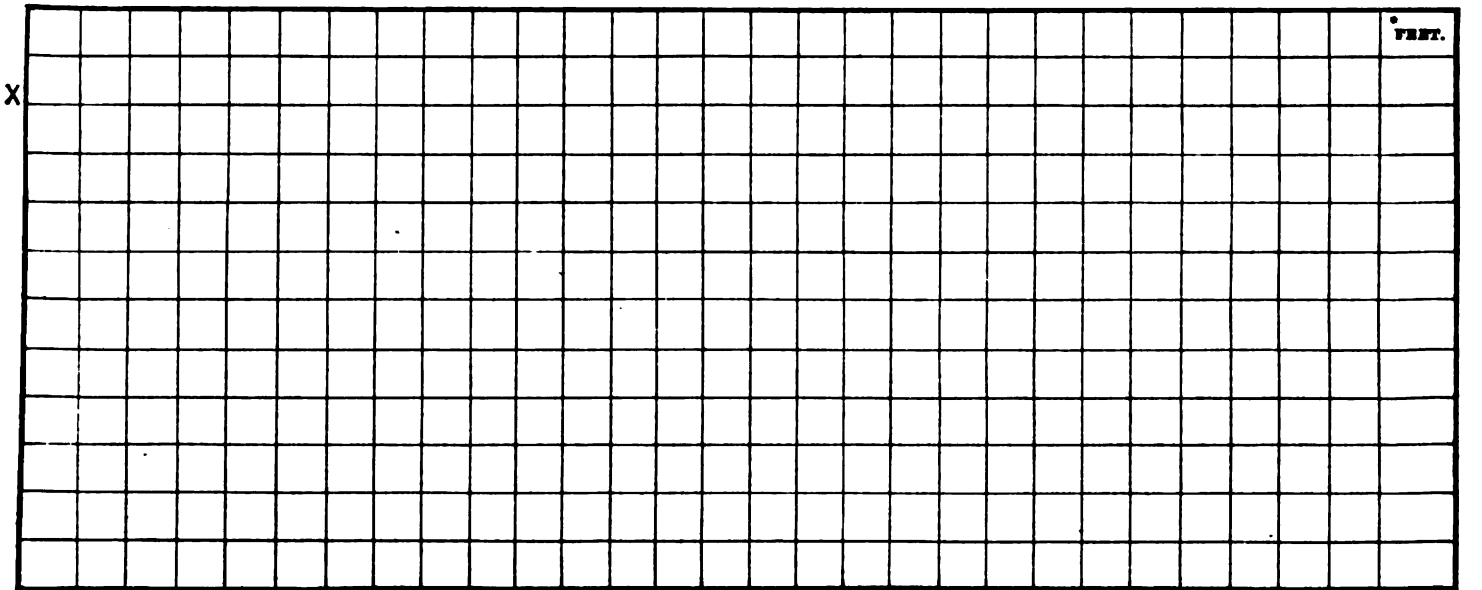
On the opposite page a Sketch Plan of the claim, group of claims or leases should be made on a scale that will admit, if possible, of showing the entire property, and principal workings, physical features, buildings, &c. The paper is blocked out in squares of one-eighth of an inch, each one of which may be made to represent any number of units of measurement considered necessary.

A sheet of tracing-cloth will be found folded at the end of this book, on which a "plan" of the *underground workings* can be made on a suitable *small* scale: this will be found to greatly facilitate the work of inspection.



No. 1. { CROSS / LONGITUDINAL } SECTION OF VEIN_____ [redacted].

*Start the highest point on vein from the line below marked* X




† One of these to be struck out.

*Show all Shafts, Tunnels, Drifts and Workings.*

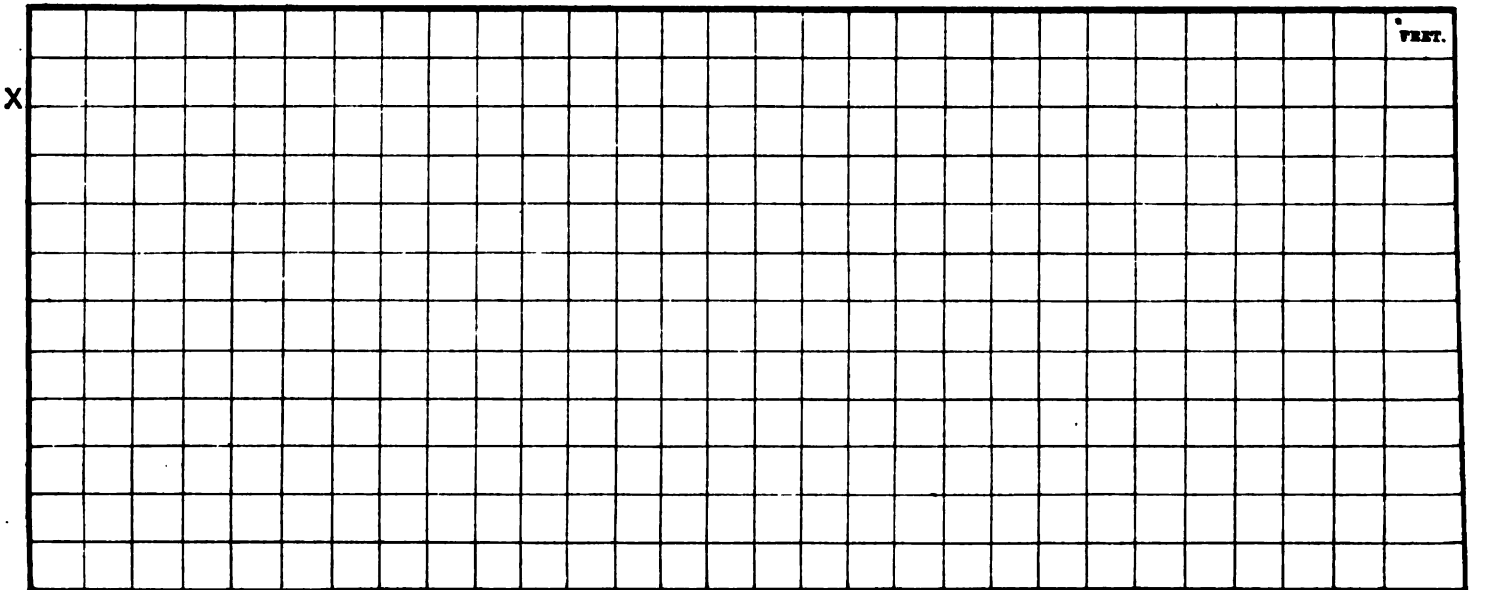
*Show contour of Surface along and across outcrop of Vein.*

SCALE * FEET TO EACH SQUARE.

* Or other unit.

No. 1. † CROSS / LONGITUDINAL SECTION OF VEIN ..... MINE.

*Start the highest point on vein from the line below marked* X




† One of these to be struck out.

*Show all Shafts, Tunnels, Drifts and Workings.*

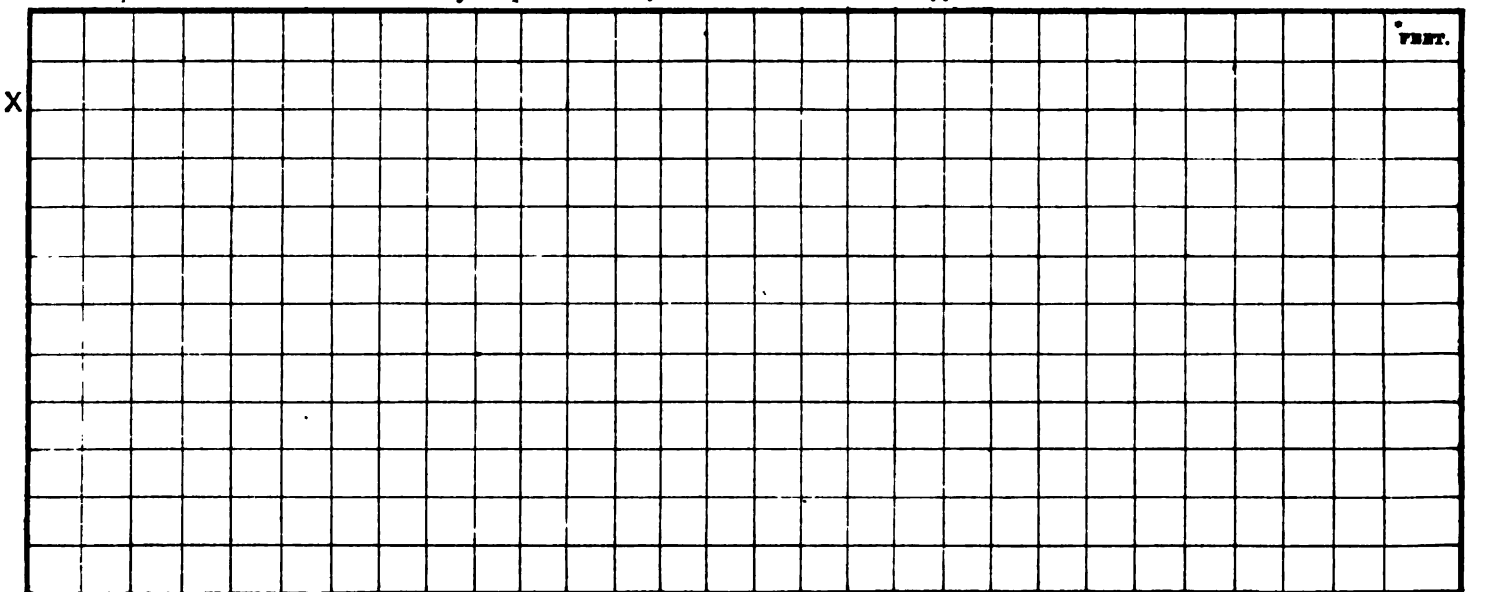
*Show contour of Surface along and across outcrop of Vein.*

SCALE * FEET TO EACH SQUARE

* Or other unit.

No. 1. † { CROSS / LONGITUDINAL } SECTION OF VEIN ..... MINE.

*Start the highest point on vein from the line below marked* X



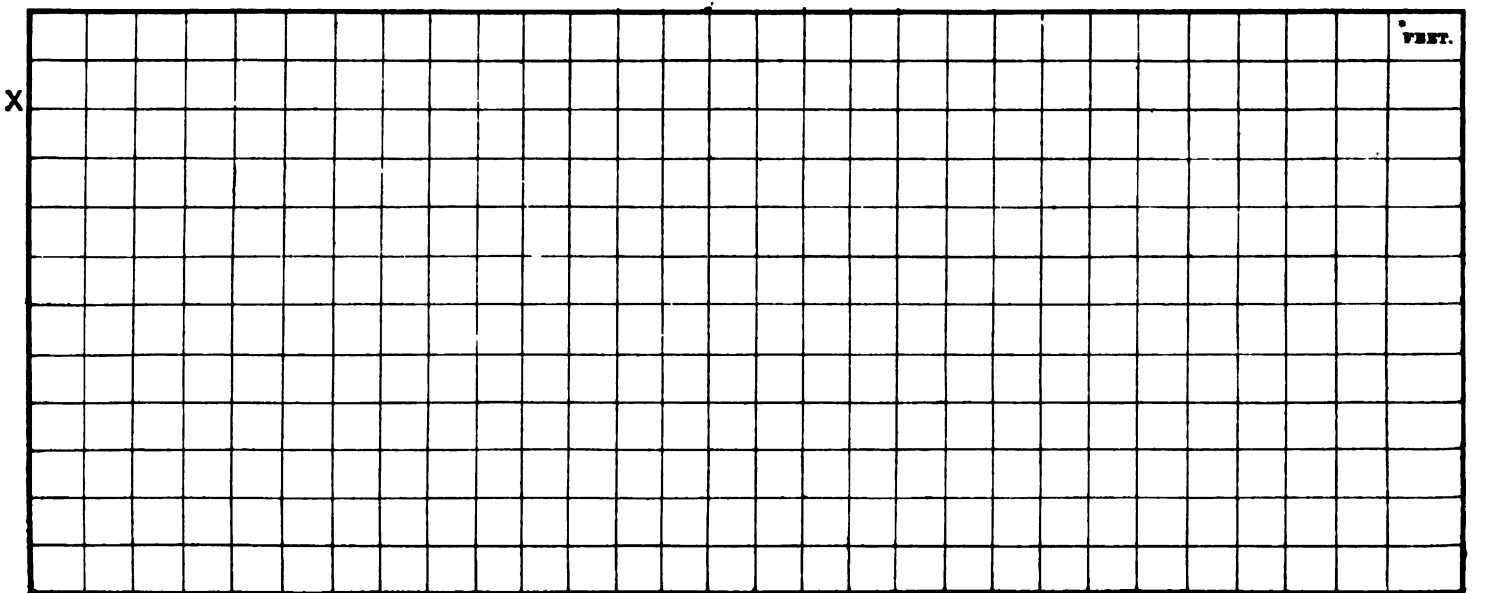

† One of these to be struck out.

*Show all Shafts, Tunnels, Drifts and Workings.*

SCALE ..... FEET TO EACH SQUARE.

No. 1. † { CROSS / LONGITUDINAL } SECTION OF VEIN ..... MINE.

*Start the highest point on vein from the line below marked* X



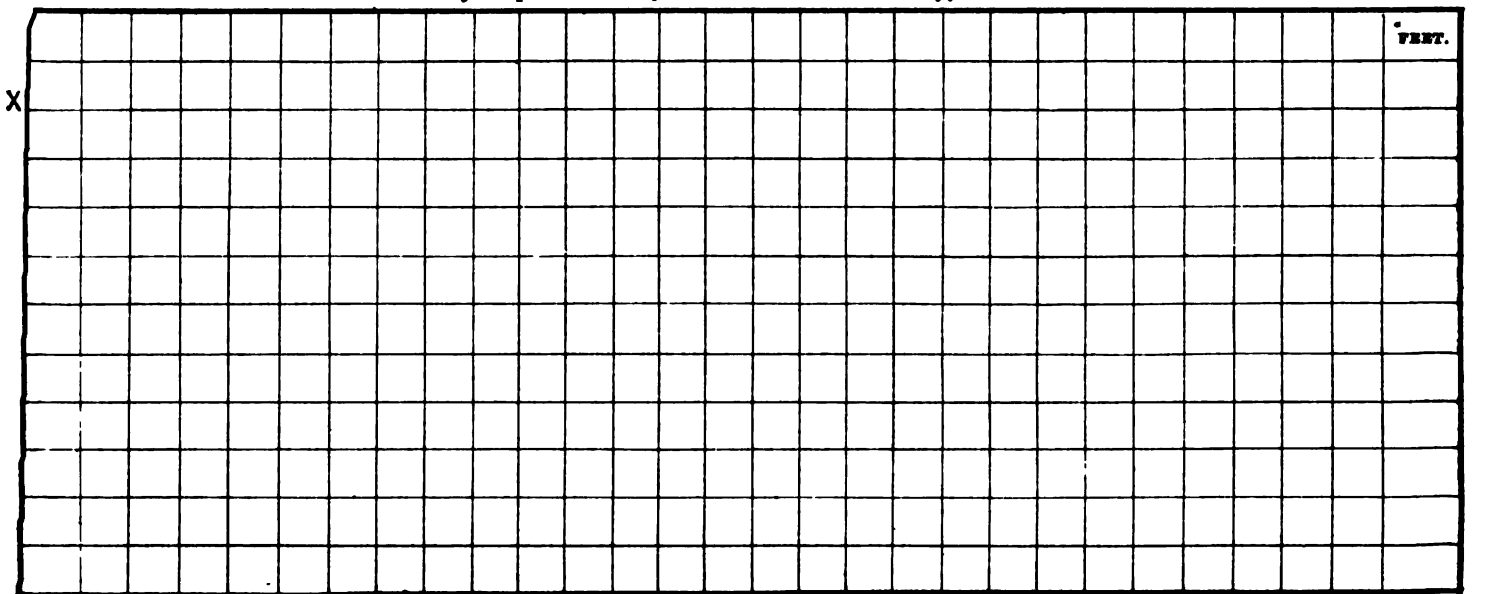

† One of these to be struck out.

*Show all Shafts, Tunnels, Drifts and Workings.*

SCALE ..... FEET TO EACH SQUARE.

† { CROSS
No. 1. { LONGITUDINAL SECTION OF VEIN ..... MINE.

*Start the highest point on vein from the line below marked* X




† One of these to be struck out. *Show all Shafts, Tunnels, Drifts and Workings.* SCALE ..... FEET TO EACH SQUARE.

**INSTRUCTIONS p. 24.** Refer to Table, pp. 146-147.

This page is for entering all items of travelling expenses connected with the examination.

NOTE.—Refer to "Useful Memoranda," pages 146-147, for Money Conversion Tables.

## SUMMARY OF TRAVELLING AND OTHER EXPENSES INCIDENTAL TO EXAMINATION.

| 19..... | | £ | s. | d. | Decimal Coinage. |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

NOTE.—Refer to "Useful Memoranda," pages 146-147, for Money Conversion Tables.

**SUMMARY OF TRAVELLING AND OTHER EXPENSES INCIDENTAL TO EXAMINATION**—*continued.*

| 19..... | | £ | s. | d. | Decimal Coinage. | |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

NOTE.—Refer to "Useful Memoranda," pages 146-147, for Money Conversion Tables.

**SUMMARY OF TRAVELLING AND OTHER EXPENSES INCIDENTAL TO EXAMINATION**—*continued.*

| 19..... | | £ | s. | d. | Decimal Coinage. | |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

NOTE.—Refer to "Useful Memoranda," pages 146-147, for Money Conversion Tables.

**SUMMARY OF TRAVELLING AND OTHER EXPENSES INCIDENTAL TO EXAMINATION**—*continued.*

| 19 | | £ | s. | d. | Decimal Coinage. |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

NOTE.—Refer to "Useful Memoranda," pages 146-147, for Money Conversion Tables.

**SUMMARY OF TRAVELLING AND OTHER EXPENSES INCIDENTAL TO EXAMINATION**—*continued.*

| 19..... | | £ | s. | d. | Decimal Coinage. | |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**INSTRUCTIONS p. 25.**

Under this head should be given a list and description of Maps, Plans, Assay-certificates, Reports and Letters, Newspaper-cuttings, Photos, &c., sent with the report.

All the above accessories give valuable information when investigating the merits of any proposition.

## ENCLOSURES.

*Under separate cover please find :—*

*Maps* .....

*Plans* .....

*Assays* .....

*Report by* .....

*Letters* .....

*Newspaper Cuttings from* .....

*Photographs* .....

**ROUTES AND TIME NECESSARY TO REACH THE PROPERTY**—*continued.*

*19* .....

| DATE. | TIME. | |
|---|---|---|
| | | *Leave* ..... *via* ..... |
| | | *Arrive* ..... ,, ..... |
| | | *Leave* ..... ,, ..... |
| | | *Arrive* ..... ,, ..... |
| | | *From the nearest Railway Station at* ..... *the distance to the Property* |

*is* ..... { †*miles*) *by* / *kilometres*) .....

.....

*Total time required for the trip* .....

† One of these to be struck out.

*Signature of Engineer*:—

## IMPORTANT.

Pages 27 to 141 have a sufficient margin to allow of their being cut out and detached for reference; so that similar questions and tables, relating to different mines an Engineer has reported upon at various times, can be filed together in groups. If a "slip" is left, it can be used for gumming on fresh pages, and thus any important information subsequently acquired about the property can be entered in this book.

## INSTRUCTIONS pp. 27—82.

In conclusion, after answering any of the following "Questions" that require reply, the writer of the foregoing report is expected to fill in the blank pages at the end of this book with his own words and ideas; and make such recommendations as will suggest the proper mode of dealing with the property.

The owners of a property may not unfrequently be willing to give "bonds" with "deeds in escrow," to parties willing to undertake a stipulated amount of development upon a property, in order to prove it in depth or extend developments, so as to properly demonstrate its merits and actual value.

# "CODIFIED QUESTIONS"

(THESE QUESTIONS AND REPLIES TO THEM CAN BE "CABLED.")

**The following questions require consideration to meet special circumstances; and a *judicious* selection should be made in each particular case, if not embodied in the foregoing General Report.**

**If there is not room to answer a question in the space left opposite it for the purpose, the reply is to be given with a corresponding number on the blank pages at the end of the book.**

**The numbering of the Questions in this Section is the same as in the 1st Edition.**

1. *State the experience and standing of the Engineer who makes this report? This "personal factor" must be taken into account in estimating its value* - - - - - -

2. *How many veins have been proved on the property? What is the nature of each vein? is it a so-called "true fissure vein," a zone of impregnated and altered rock, a contact vein, a bedded or segregated deposit, a gash vein, stock-work, or irregular deposit*

3. *Is it fairly regular or irregular in width and values?* - -

4. *Has it a "selvage" or "parting" of any kind, and of what character?* - - - - - - - - - -

**QUESTIONS**—*continued.*

5. *What is the nature of the "hanging" and "footwalls?" Does it appear that the country rock influences the lode filling? (See Question* 30) - - - - - - - - -

6. *Is it good holding-ground on both walls?* - . - - -

7. *Is the ore separated from the "country rock" by a "lode formation" or matrix of any kind?* - - - - -

8. *Is it easy or hard driving ground, and having regard to the character and width of vein, and the nature of the walls, what stoping width can be most profitably removed?* - - -

9. *Is there a well-defined or irregular "pay streak" in the lode, or must it be removed from wall to wall?* - - -

10. *Is it easier driving in the lode or alongside of it?* - - -

11. *Is the outcrop of the vein exposed at surface?* (*See Question* 26)

**QUESTIONS**—*continued.*

12. *For what length can it be traced without a break; and what is the distance between the points exposed?* - - - -

13. *Is the ore free-milling or otherwise?* - - - - -

14. *Is the ore of a distinctly acid or basic character?* - - -

15. *Is the "free" gold coarse or fine, or both coarse and fine; mechanically or chemically combined; or, although "free," unamalgamable (rusty)?* - - - - - - - -

16. *Is there likely to be much float gold, or gold lost in milling?* -

17. *What are the silver minerals found in the ore?* - - -

18. *How are the gold and silver distributed in the ore? see* TABLES I *and* II - - - - - - - - -

**QUESTIONS**—*continued.*

19. *If requisite give a chemical analysis of the ore; and the fluxes necessary for smelting it.* (*Fill in page* 86) - - -

20. *State if there are any constituents present in the ore in such proportions as to depreciate the commercial value of the product; and to what extent are they likely to influence the recovery of the metals present?* - - - - -

21. *Is the physical character of the ore, or its mineralogical composition, likely to prejudicially affect its reduction, or the extraction of the metals it contains?* * - - - -

* In the case of a gold-ore, large losses may occur, (*a*) through the excessively fine state of division of the gold particles, (*b*) through the clayey or talcose character of the gangue producing an excessive quantity of slime and preventing proper contact with the amalgamated surface of the plates, which is also liable to happen if there is much limonite (hydrated oxide of iron) present; heavy-spar (sulphate of baryta) and oxides of manganese produce much the same effect. Pyrites, more particularly partially decomposed copper-pyrites, zinc blende and galena, tend to flour the mercury and cause loss, and any soluble sulphates of copper, resulting from decomposition, may be reduced by the iron of the mortar to metallic copper, which is readily amalgamated, and this cupriferous mercury has the very undesirable property of taking up fine particles of iron, which also results in "flouring" the amalgam present; native antimony, native bismuth and their sulphides and arsenical pyrites are even worse in this respect. (*c*) A coating of silica, silicate of iron, or copper oxide may also render the gold partly unamalgamable. (*d*) The chemical combination of gold with other elements may influence the results, notably when gold and silver are alloyed in certain proportions; when gold is alloyed with bismuth (maldonite and bismuthaurite); when accompanied by tellurides of gold, and of gold and silver; or when selenides of gold are present. (*e*) Gold which has absorbed sulphur from sulphuretted hydrogen or sulphide of ammonium, though presenting a bright surface, also refuses to amalgamate unless annealed.

**QUESTIONS**—*continued.*

22. *Are the character of the ore, the characteristics of the lode, and the surrounding geological conditions the same in the adjoining properties; and are they common to the district as a whole?* - - - - - - - - -

23. *Does the ore change below water-level?* * *Note if there is any surface enrichment.* - - - - - - - - -

24. *What percentage of "Sulphides" does the ore carry?*- - -

25. *What is their nature?* - - - - - - - - -

26. *Does the back of the lode carry a "gossan cap," if so for what distance and to what depth at different points?* - - -

27. *Are any special minerals generally found in association with the "pay ore," and are they liable to affect its treatment?* (*See Question* 35) - - - - - - - - - -

* This applies particularly to Gold, Silver and Copper.

**QUESTIONS**—*continued.*

28. *If a* **Gold** *or* **Silver** *mine; what is the character of the quartz, has it a "kindly" appearance or the reverse. (The former being generally a dark greyish-blue or brown, semi-transparent resinous looking stone, or white, laminated and separated by thin talcose graphitic or chloritic partings, frequently iron or copper stained, and carrying galena, pyrites or blende. The latter a white vitreous quartz or opaque milky vein stone, with but little mineral or metal visible. "Specimen quartz" is frequently however white and clouded* - - - - -

29 *What is the lode stuff or matrix, i.e., "formation" (an Australian term)?* - - - - - - - - - - -

30. *Have alterations in the nature of the adjacent rock, or in the strike or dip of the veins, been found to influence the ore-bearing zones?* (*See question* 5). - - - - -

**QUESTIONS**—*continued.*

31. *How do any existing dykes or cross-courses influence the lodes of the district?* - - - - - - - - - -

32. *Have "slickensides" or "indicators" been observed, and does "ore occur against ore" in parallel veins that have been already "proved"* - - - - - - - - - -

33. *Is the ore regular, occurring in "shoots," with the mineral finely and regularly disseminated through the vein-stuff; or is the lode of a banded character; or does the ore occur in lenticular bodies, pockets or pipes; what distance separates the "shoots" or ore-bodies, and what are the number, size and average value of these latter?* - - - - - - - -

34. *What is the direction and amount of "pitch" of the ore shoots?* -

35. *Is the "lode-formation" of a kindly nature or the reverse; and what minerals are present in the ore?* (*See questions* 27) -

**QUESTIONS**—*continued.*

36. *Are any of the existing proved "shoots" widening or narrowing in length with increased depth?* † - - - - - - -

37. *Can the vein be best worked by "open-cast"; with open "gunnies"; with "overhand" or "underhand stopes"; or by horizontal or vertical slices; and does it need timbering or "packing"; if the latter, where can it best be obtained? Fill in tables pp.* 89–90

38. *Can the vein be developed by cross-cut tunnels, or by adit levels along the vein, and to what vertical depth? state their length at different depths.* - - - - - - - - -

39. *Can the lode be developed best by vertical or underlie shafts?* -

40. *How much ore has been removed from the mine?* . . .

41. *What is the amount and value of the "ore in sight"* * *(blocked out) and the estimated amount of "probable reserves"?* - -

† Particular attention should always be given to the deepest points in the Mine and the ends of the principal levels.
* See "Instructions" page 16.

**QUESTIONS**—*continued.*

42. *What is the approximate area of ground † stoped up to date of this report; and of the "reserves" ready for stoping?* - -

43. *What is the proportion of "developed" to "undeveloped" ground opened up at date of report?* - - - - - -

44. *How much ore is on the dumps and what is its value?* - -

45. *What quantity of ore can be produced at present per diem?* -

46. *With how many men stoping can this output be obtained?* - -

47. *What is the total amount of development work already done, and what length of shafts and levels have been timbered?* - -

48. *What is the nature and cost of the timbering, walling, or other means of support used, or that can best be used?* - - -

† A Planimeter can be used with advantage for this purpose.

**QUESTIONS**—*continued.*

49. *What is the average distance of the main levels apart, and at what distance apart is it proposed to drive them; state what method has been hitherto employed for removing the ore?* - - -

50. *What other properties are situated along the same line of country; and how far off are they?* - - - - -

51. *How does the ore compare in grade and character with the ore in neighbouring mines?* (*See questions* 27 *&* 35) - - -

52. *Are there any local surface indications or geological evidence, such as contour of ground, colour of surface, nature of decomposed outcrop (gossan), ordinary springs, mineral springs, indicative plants, altered vegetation, lode lights, burrows of animals, shoadstones, old workings, slag-heaps, ruins, old records, or names of places to guide the prospector?* - - - -

**QUESTIONS**—*continued.*

53. *How many cubic feet of ore (broken, and in place) are reckoned to the ton employed? or how much does a cubic yard or metre weigh?*

54. *What is the average amount of moisture in the concentrates or shipping ore?* - - - - - - - - - -

55. *What is the distance of the mine from the nearest waggon road?*

56. *What is the distance to the nearest sea port?* - - - - -

57. *Is there any water in the mine?* - - - - - - -

58. *At what depth was water struck?* - - - - - - -

59. *What quantity of water does the mine make per diem at present, and what is the probability of its increasing or diminishing, in one or more of the shafts? Is it acid or does it contain salts?* - - - - - - - - - - -

**QUESTIONS**—*continued.*

60. *What size, make and type of pumps are in use, or likely to be required, stating their length of stroke, speed and diameter as well as their capacity in gallons per minute, height of lift and pump horse-power developed?* - - - - - - -

61. *What is the estimated cost of a pumping plant sufficient to cope with any future probable requirements; including cost of engine and "pit work" and erection of both in place?* - -

62. *What is the estimated present and future cost af pumping, reckoned per ton of output upon the basis of the present monthly charges?* - - - - - - - - -

63. *Is there a sufficient supply of water for "power" and "dressing" at the mine; how much is needed, and how can it be obtained?* - - - - - - - - - - -

**QUESTIONS**—*continued.*

64. *What are the existing winding and underground haulage arrangements, and are any changes contemplated?* - - - -

65. *State the make, type, dimensions, speed, and power of engines in use; and the depth of the various winding shafts; and size and quality of wire ropes?* - - - - - - - -

66. *What is the present cost of tramming underground and winding per ton on a given output, and what is the future cost of these items likely to be?* - - - - - - - - -

67. *How are the workings ventilated, and is there any expense attaching to it?* - - - - - - - - -

68. *If there is an air compressor at the mine, state its power, dimensions, speed, capacity, make and type; what kind and size of power "drills" are used in connection with it; and what is the cost of running the compressor? How do machine-drilling and hand-drilling compare in regard to speed and cost? (a) for development-work; (b) for stoping.* - - -

**QUESTIONS**—*continued.*

69. *How many "power drills" or "pneumatic" hand drills of the type and size in use can the present compressor run; at what pressure of air; and what does it cost to run a drill on the average?* -

70. *Can diamond drills be profitably employed for prospecting underground or on surface, run by power, or by hand?* - -

71. *What explosives are used, and what is the average monthly consumption of these and other mine supplies, enumerated below? (a) Hand drilling; (b) machine drilling* - -

72. *What is the cost of drill-steel per lb. or kilo?* - - - -

73. ,, *fuze per dozen coils?* - - - - -

74. ,, *mining candles of best quality per box, lb., or kilo?* - - - - - -

75. ,, *caps per* 1000*?* - - - - - -

**QUESTIONS**—*continued.*

76. *What is the cost of cotton waste per lb. or kilo.?* - - -

77. ,, *colza oil or paraffin per drum, case, or barrel?*

78. ,, *dynamite per case, lb., or kilo.?* - - -

79. ,, *powder per lb., kilo., or keg?* - - -

80. *Is there timber actually on the property, or near by?* - - -

81. *What is the fuel in the district most suitable for power purposes; what timber is obtainable for purposes of construction; to what size does it run and what is its cost?* - - - -

82. *What progress can be made per week in* (1) *sinking shafts and* (2) *winzes;* (3) *in rises; and* (4) *in driving levels and* (5) *cross-cuts?* (a) *by machines* (b) *by hand* - - - - -

**QUESTIONS**—*continued.*

83. *What are the designations, dimensions and divisions of the different shafts, and for what purposes are they employed?* -

84. *What are their relative positions and distances apart?-* - -

85. *What machinery is there at the mine?* - - - - -

86. *What money has been spent on it, and upon "development" work?*

87. *What time is estimated as necessary to erect the entire plant in running order, and what is the new plant to consist of?* -

88. *What is the estimated cost of the entire plant when remodelled?* -

89. *Is the neighbourhood of the mine healthy or unhealthy, and what are the most prevalent complaints? Hygiene is often worth study.* - - - - - - - - - - -

**QUESTIONS**—*continued.*

90. *Which are the healthy, and which the unhealthy seasons?* - -

91. *Are cyclones prevalent?* - - - - - - - - -

92. *What is the mean summer temperature and winter temperature, and what is the average rainfall of the district?* - - -

93. *To what extent are the river levels and water supply affected by it?* - - - - - - - - - - -

24. *Which are the rainy, and which the hot or cold months?* - -

95. *Is the rainfall equally distributed or generally irregular?* - -

96. *Is there a heavy snowfall; if so, for how long does it stop or interfere with work?* - - - - - - - - -

97. *Are white ants or other insect pests common?* - - - - -

**QUESTIONS**—*continued.*

98. *Is labour abundant, locally or otherwise, and of what class?* -

99. *Are there any provisions in the local mining regulations, or laws of the country, that affect the value or acquisition of the properties, favourably or otherwise?* - - - - -

100. *State if there are any local taxes and duties on imported machinery, etc., that affect mining?* - - - - -

101. *State if there are any Government royalties or private "dues" chargeable on the property, or upon the process employed?* -

102. *What are the terms and labour conditions under which the properties are held from the Government? If Insurance of employees compulsory, state at what rates.* - - - -

103. *Are there public crushing mills or reduction works in the neighbourhood?* - - - - - - - - - -

**QUESTIONS**—*continued.*

104. *What is the distance of the mine from the nearest public reduction works; or from the mill or "smelter" belonging to the Company owning the mine?* - - - - - - - -

105. *What are the charges at the neighbouring Customs works?* - -

106. *Has a mill site been secured; under what title is it held; and how is it situated relative to the mine and water supply; does it possess a good fall and suitable ground for foundations; and is there a "water-right," "dam-site," and ample "dumping-ground" in connection with it?* - - - -

107. *Is it requisite to ship any part of the ore for treatment to a distance, if so, how much and where?* - - - - -

108. *What prices are offered for ore of a given grade in the nearest market?* - - - - - - - - - -

**QUESTIONS**—*continued.*

109. *If a* **Copper** *mine, describe the ore, and its mode of occurrence, whether or not it carries gold, silver, or objectionable impurities; and the quantity of "standard" or "fine" copper the mine produced per annum, if it has been already worked.* - -

110. *State the quantity of crude ore treated per annum of a given percentage.* - - - - - - - - - -

111. *State the percentage of copper therein contained.* - - -

112. *State the quantity of concentrates produced, and their average tenor and value and the net profit realized, having regard to development, mining, reduction, freight, marketing and general charges.* - - - - - - - - - - -

113. *State the loss of copper per ton of crude ore mined in concentrating by water, oil, or magnetically; in smelting the mineral; and in transport.* - - - - - - - - -

**QUESTIONS**—*continued.*

114. *State the quantity of G.M.B. or "refined" copper produced per annum up to date in lb. or kilo., and whether obtained by ordinary smelting in reverberatory or shaft furnaces; by "Pyritic smelting," or a "wet process," or a combination of these?* - - - - - - - - - - -

115. *State the average value of the products per lb. or kilo.* - -

116. *State the cost per ton of ore, and per lb. or kilo. of "Standard" (G.M.B.) or "refined copper" produced, for development, mining, surface-expenses, transport, crushing and concentrating, briquetting, smelting, freight, marketing, etc., or "cementation."*

117. *State the net profit or loss per ton of ore treated, as shown by results; or estimated.* - - - - - - - - -

118. *If a* **Lead** *or* **Zinc** *mine, or one producing both metals, describe the ore and its mode of occurrence, and whether or not it contains silver or gold besides; as well as the nature of any associated minerals.* - - - - - - - - -

**QUESTIONS**—*continued.*

119. *State the quantity of crude ore treated per annum, and the percentage of galena, blende, or other metals and minerals therein contained.* - - - - - - - - - - -

120. *State the quantity of concentrates of each class produced, and their average tenor and values in lead and zinc as well as in gold and silver.* - - - - - - - - - -

121. *State the loss of mineral per ton of crude ore, of each class mined, in concentrating by water, oil, or magnetically, and the losses of metal in smelting and in transport.* - - - - -

122. *State the quantity of lead and spelter produced.* - - -

123. *State the value of these metals at current quotations and over an average of years.* - - - - - - - - -

**QUESTIONS**—*continued.*

124. *State the cost per ton of development, mining (stoping), surface expenses, transport, crushing and concentrating, freight, smelting, marketing, etc., calculated both on the crude ore mined, and on the quantity of concentrates produced.* - -

125. *State the net profit or loss per ton of ore treated, as shown or estimated from results* - - - - - - - -

126. *State the present net value of the ore or concentrates per ton on the spot, having regard to development, mining, reduction, freight, marketing and general charges.* - - - - -

127. *State the world's production, supply, consumption, and market price of silver, copper, lead, zinc or other metal during the last few years; the causes likely to affect its future price; and what has been the production of the district in which the mine is situated.* - - - - - - - - - -

128. *Where has the world's supply been chiefly obtained, and disposed of; and what is the present estimated world's stock of metal on hand?* - - - - - - - - - - -

**QUESTIONS**—*continued.*

129. *Is there likely to be a rise or fall in the price of the metal or metals due to increased consumption or demand, or other cause?* - - - - - - - - - - - - -

130. *If the ore can be enriched by hand-picking, state to what extent this is practicable; giving the proportion and value of the various grades of sorted products produced?* - - - -

131. *Ascertain by sieving* tests, to what size the ore should be crushed to give the best commercial results, with the highest possible extraction?* - - - - - - - - - -

132. *State whether this reduction can be effected in one operation or requires to be done gradually in one or more stages?* - -

133. *If a stamp battery is included in the purchase or its erection is contemplated, state the number and kind of engines, and the estimated power required to drive the machinery, allowing for power losses from friction, &c.* *see* TABLE III. - - -

* NOTE.—Using in this connection the "I.M.M. Standard Laboratory Screens" recommended by the Institution of Mining and Metallurgy, 1907. See Table p. 151.

**QUESTIONS**—*continued.*

133. (1) *The nature of the battery site and amount of fall available.*

(2) *The type of battery and the number of stamps.* - - -

(3) *The weight of the stamps in lb.* - - - - - -

(4) *The drop in inches.* - - - - - - - -

(5) *The number of drops per minute.* - - - - -

(6) *The order of fall.* - - - - - - - -

(7) *The height of discharge.* - - - - - - -

(8) *The type of mortar used and foundations (wood or concrete).* -

(9) *The inside dimensions of the mortar.* - - - - -

**QUESTIONS**—*continued.*

(10) *The duty of the stamps in tons crushed per head in 24 hours; and H.P. per stamp. Is the battery doing the best possible work on the ore in queston? If not what improvements can be made?* - - - - -

(11) *The material used for shoes and dies, see* TABLE IV. - -

(12) *The wear and cost of the material of which the shoes and dies are made, see* TABLE IV. - - - - -

(13) *The material of the stems, cams and tappets (see Question 24).*

(14) *The proportion of stems, etc., broken.* - - - -

(15) *The quantity of water used by the battery per minute in gallons or cubic feet; and the method of introducing it into the battery.* - - - - - - - -

**QUESTIONS**—*continued.*

(16) *The quality of the water supply available for battery purposes and boilers, whether hard, soft, or impure; and if "condensed" water has to be used?* - - - - -

(17) *The amount of ore per cubic foot of water discharged from the battery in the pulp.* - - - - - - -

(18) *The quantity of water needed outside (if any) to supplement the battery supply.* - - - - - - - -

(19) *The kind of screens used, whether Russia-iron, bronze, tin, or iron-cloth, round holes or slot punched, size, wear and number of holes, see* TABLES V, V[a] *and* VI, *and whether vertical or inclined.* - - - - - - - -

(20) *The dimensions of the screen opening (inside frame) and whether vertical or inclined.* - - - - - -

**QUESTIONS**—*continued.*

(21) *The size of the battery apron and sluices, their slope in degrees or in inches per running foot, and the number of wells, traps, etc., used.* - - - - - - - -

(22) *Whether "plates" are used inside or outside the battery, and their size.* - - - - - - - - - -

(23) *Whether the "coppers" are plain, electro-plated or "Muntz metal."* - - - - - - - - - -

(24) *Whether patent cams or any other special appliances are used.* - - - - - - - - - - -

(25) *Whether automatic or hand feeding is used; if the former, the kind of feeder.* - - - - - - - -

(26) *If rock-breakers are used, state their kind and number; the cost of "crushing," including repairs; and to what size the ore is crushed in the rock-breakers.* - - - -

**QUESTIONS**—*continued.*

(27) *If the ore is concentrated, give the number, kind and capacity of such concentrators; and the cost of concentration per ton of crude ore, and of concentrates produced, including the cost of repairs, and extra water required.* - - - -

(28) *State the number and kind of "ball-mills," pans, barrels or other grinding machines used; and give the cost of repairs.*

(29) *If the ore is ground in "pans" fill in* TABLE VII. - -

(30) *State the chemicals employed (if any) and quantity of water required.* - - - - - - - - - -

(31) *State the cost of milling, sub-divided as per* TABLES VIII. AND IX. - - - - - - - - - -

**QUESTIONS**—*continued.*

(32) *State the number of mill hands employed to run the mill part or full time, and their rates of pay as per* TABLE IX.

(33) *State the cost of the mill and its accessory plant in £ s. d. or $ per stamp.* - - - - - - - - -

(34) *State the comparative results obtained at different mills in the same district, as per* TABLE X. - - - - -

134. *State the relative percentages of gold and silver saved in milling, see* TABLE XI. - - - - - - - - - -

135. *State the actual results obtained by trial crushing by the different mill appliances; see* TABLE XII. - - - - - - -

136. *Give the retort percentage of the amalgam.* - - - - -

**QUESTIONS**—*continued.*

137. *Give the weight and percentage of amalgam and bullion obtained per ton of ore treated. See* TABLE XIII. - - - -

138. *State the quantity of mercury required to charge the whole mill and how it is distributed.* - - - - - - - -

139. *State the nature and percentage of sulphurets in the concentrates.*

140. *State the tenor and value of the concentrates per ton; giving the prices at which the metals are valued.* - - - - -

| | †oz. | dwt. | gr. | £ | s. | d. |
|---|---|---|---|---|---|---|
| (*a*) *In gold* | | | | | | |
| | †oz. | dwt. | gr. | £ | s. | d. |
| (*b*) *In silver* | | | | | | |
| | % | | | £ | s. | d. |
| (*c*) *In other metal (* ) | | | | | | |

† NOTE.—The better practice would be to give these figures in ounces and decimals of an ounce; as recommended by the Institution of Mining and Metallurgy.

**QUESTIONS**—*continued.*

141. *State the loss of free gold in the tailings.* - - - - -

142. *State the loss of other metals in the tailings.* - - - -

143. *State the loss of mercury in the tailings, see* TABLE XIV. - -

144. *State the number of tons of ore crushed upon which the foregoing estimates are based.* - - - - - - - - -

145. *State the date and time the crushing lasted in days and hours; the sampling appliances and the method employed.* - -

146. *State the nature of any sorting or sizing which the ore undergoes, and the various products obtained.* - - - -

147. *If a Huntington Mill is used fill in* TABLE XV. - - -

**QUESTIONS**—*continued.*

148. *If rolls or other crushers are used, show the cost in detail of labour and renewal of working parts, as well as power required for operating them.* - - - - - - -

149. *If the ore is roasted, state the number and description of furnaces required, the capacity of each furnace per* 24 *hours, its fuel consumption, the labour and power needed to operate it; the cost of repairs, and the total cost of roasting per ton of crude ore. State whether the ore "decrepitates."* - -

150. *If the ore is roasted and chloridized, state the percentage of salt used.* - - - - - - - - - - -

(*a*) *The losses of gold and silver in roasting, and whether traceable to any special constituents of the ore or other causes.* - - - - - -

**QUESTIONS**—*continued.*

(*b*) *The size to which the roasted ore was previously crushed.* - - - - - - - -

(*c*) *The cost per ton of roasting itemized as per* TABLE XVI. *or* TABLE XVII. - - - - -

151. *State the fineness of the bullion produced per* 1000. - - -

†

152. *State the average cost per ton, method of treatment, and working results of cyanide treatment, see* TABLES XVIII., XIX[a]., XIX[b]., XIX[c]., XIX[d]., XIX[e]., XIX[f]., *and* XIX[g]. - - - - -

153. *State the average cost per ton of lixiviation, see* TABLES XX., XX[a]., XXI., XXII., XXIII., XXIV., XXV., XXV[a]., XXV[b]., *and* XXV[c]., *describing the system of treatment adopted.* - - - -

† NOTE.—In this connection, consideration must be given to the question of "single" or "double treatment," the relative advantage of the "agitation" and "filter-press" methods for the treatment of "slimes," and the type of filter used (whether of the Dehne, Ridgway or other class); looking into details of capacity, filling and discharging "presses," "washing," weight and thickness of cakes, moisture in cakes, time of operation, etc.

**QUESTIONS**—*continued.*

154. *State the average cost per ton of other methods of treatment if employed, see* TABLES XXVI., XXVII., XXVIII., XXIX., XXIX[a]., XXX., XXXI. *and* XXXII. *giving details of the process employed.* - - - - - - - - - -

155. *State whether selected ores or concentrates have to be dealt with.* - - - - - - - - - - -

156. *State the percentage of metal saved by any of the above processes and the itemized monthly cost. See* TABLE XXXIII. - -

157. *State the cost of production per ounce of gold, silver, or bullion produced, giving in the latter case its "fineness."* - - -

158. *If more than one process is on trial, fill in* TABLE XXXIV. - -

**QUESTIONS**—*continued.*

159. *The question of enlarging existing works should be considered, and the arrangements that can be made to treat ore for outside parties by contract.* - - - - - - -

(*a*) *On tariff.* - - - - - - - -

(*b*) *By purchase.* - - - - - - - -

160. *If the Company owns smelting works, give a description of the process and the location of the works.* - - - - -

(*a*) *The description and number of the furnaces; and enumerate any other plant employed.* - - -

(*b*) *The capacity of each furnace per 24 hours and the method of operating it; the average length of "runs"; and the grade of the "matte" produced, if smelting to "matte."* - - - - -

(*c*) *The pressure of the blast employed; water supply needed and available; nature of furnace site, and dumping ground.* - - - - -

**QUESTIONS**—*continued.*

161. *State the contents of the ore and the percentage of extraction of the metals contained in it; and whether any minerals in the ore are likely to affect the smelting results favourably or otherwise.* - - - - - - - - - - -

162. *State the bullion yield per diem and its value.* - - - - -

163. *State the quantity and kind of other products produced and their value.* - - - - - - - - - - - -

164. *State the loss of metal in fume, dust, and slag separately.* - -

165. *State the nature, quantity and cost of fluxes required and procurable; and the average composition of the "charge."*

166. *State the quantity and cost of labour, fuel, water, etc.; and the percentage of fuel to the charge.* - - - - -

167. *State the cost of materials for repairs to furnaces, etc.* -

168. *State the total cost of smelting.* - - - - - -

*Vide* TABLE XXIII.

**QUESTIONS**—*continued.*

169, *State the average number of men employed.* - - - -

(1) *In the mine:—*

(A) *On wages (day-pay).* - - - - - - -

(B) *On contract.* - - - - - - -

(C) *On tribute.* - - - - - - - - -

(2) *In the mill.* - - - - - - - - -

(3) *On the surface.* - - - - - - - - -

(4) *On the Staff (Manager, Surveyor, Assayer, Mine Captain, Reduction Officer, Clerk).* - - - - -

**QUESTIONS**—*continued.*

170. *The consumption of coal, coke, wood, charcoal, oil, or other fuel per diem :—*

(1) *At the mine.* - - - - - - - -

(2) *At the mill or other works.* - - - - - -

(A) *For power purposes.* - - - - - -

(B) *For roasting or drying ore.* - - - - -

(C) *For smelting.* - - - - - - -

171. *State the consumption of coke or charcoal monthly in bushels :—*

(1) *For blacksmith's work.* - - - - - - -

(2) *For melting and assaying.* - - - - - -

172. *State the number, kind, size and power of steam engines and boilers, gas engines, or water or electric motors in use or likely to be required ; and the average cost of power per I.H.P. per annum, for each class of motor.* - - - - - -

**QUESTIONS**—*continued.*

173. *State the quantity of water in cubic feet or "miner's inches" used by each motor and the "head" in feet if hydraulic power is employed.* - - - - - - - - -

174. *State if there is a sufficient supply of water on the property to run the mill or works, the quantity required, how it can best be delivered and its distance from the works, size of reservoirs (if any) and cost of making dams and water conduits.* - -

175. *State if the water is suitable for drinking and boiler purposes or otherwise, and the nature of any impurities it contains* - -

176. *State the nature and cost of steam, pneumatic, electric, oil, cable, or animal traction, available or contemplated, giving the number of draught animals employed and the cost of their keep; and the cost of "plant" for mechanical haulage if installed or to be erected.* - - - - - -

**QUESTIONS**—*continued.*

177. *State the cost and character of exploratory work hitherto done, whether by levels and crosscuts or (diamond) drills.* - -

178. *State separately the amount of exploratory and development work done during the last three years the mine was worked, if possible.*

179. *State separately the amount of ore extracted from the mine during the last three years the mine was worked, if possible.* - -

180. *State separately the total quantity of ore sold or treated in the three previous years, if possible.* - - - - - -

181. *State separately the average assay value or "percentage composition" of the ore sold or treated in the last three years, if possible, and any marked variations in value observed at different levels in the mine, along the course of the main ore shoots.* -

**QUESTIONS**—*continued.*

182. *State the total yield of bullion, its fineness and value in gold and silver or other metals, such as copper, lead and zinc, produced in the three previous years, given separately and detailed for the last 12 months, if possible.* - - - -

183. *State the total number of days the mine or works were idle during the three previous years, and the cause, if possible.* - -

184. *Show, if possible, the total gross cost of labour employed during the three previous years:—*

(A) *At the mine.* - - - - - - - -

(B) *At the works.* - - - - - - - -

(C) *On surface.* - - - - - - - - -

**QUESTIONS**—*continued.*

185. *Show, if possible, the total gross cost of supplies and materials of all kinds consumed during the three previous years*:—

(A) *At the mine underground.* - - - - -

(B) *At the reduction works.* - - - - - -

(C) *On general surface account.* - - - - -

186. *Show if possible the total gross cost of administration per annum, during the past 3 years, including salaries, rent, taxes,† office expenses, insurance, interest, legal and transport charges, etc.*

187. *Show if possible the total average expenditure at the mine and works per annum (including administration), based on the last three years' results; if only one year's results are known fill in* TABLE XXXV. - - - - - - - - -

188. *State any proposed changes or improvements that can be introduced with a view to cheapen cost in the future.* - -

† NOTE.—It is important to ascertain if there are any special taxes, such as "export taxes" on ore, etc.; as these sometimes constitute an important item of cost; and in some cases increase the value of the product; as, for instance, the value of copper produced and sold in Russia.

**QUESTIONS**—*continued.*

189. *State if possible the total quantity of ore the mine has produced from its commencement or so far as records go back.* - -

190. *State if possible the average yield of the ore throughout, and whether it was sold or treated on the spot, and by what process or processes.* - - - - - - - - - -

191. *State the present average daily output of ore maintainable, and the best method of future treatment.* - - - - -

192. *State the approximate quantity of ore on the dumps at the time of the report, and its estimated value.* - - - - -

193. *State the present estimated cash value of the mine itself, based on the actual "ore reserves" in sight, apart from "probable reserves"; estimating these latter separately.* - - -

194. *State the present estimated cash value of the underground improvements, shafts, tunnels, drives, etc., given separately.* -

**QUESTIONS**—*continued.*

195. *State the present estimated cash value of the buildings at the mine including engine shed, pit-head framing, shops and offices.*

196. *State the present estimated cash value of the mine machinery, including engines, boilers, pumps, compressors, drills, cars, tools, etc., above and below ground.* - - - - -

197. *State the present estimated cash value of mine "supplies" of all kinds on hand.* - - - - - - - - - -

198. *State the present estimated cash value of the mill, smelting or other reduction plant and buildings connected therewith, valueing the latter separately.* - - - - - -

199. *State the present estimated cash value of mill and surface "supplies" of all kinds on hand when the valuation is made.*

**QUESTIONS**—*continued.*

200. *State the present estimated cash value of the surface rights, reservoirs, etc., and of any dwellings, offices, etc., erected on the property, not included in the foregoing.* - - - -

201. *State the present estimated cash value of machinery, tools and plant of all kinds (except buildings) not directly connected with the mine or mill.* - - - - - - - -

202. *State the present estimated gross value of the mine and works connected with it, valued upon the basis explained in "General Notes."* - - - - - - - - -

203. *State the actual, gross and net profit on present scale of working.*

204. *State the actual, gross and net profit on previous operations.* -

205. *State the probable gross and net profit on future proposed scale of working per annum.* - - - - - - - -

**QUESTIONS**—*continued.*

206. *The possibility of supplementing profits from the mine itself by treating ore for outside parties and other available sources of revenue must be carefully considered.* - - - - -

207. *The sum (if any) set aside or proposed to be set aside out of profits for redemption of capital and depreciation of plant, and the basis on which the "redemption" of ore is calculated, should be stated.* - - - - - - - - -

208. *State what capitalization the property can reasonably stand on the basis of actual present profit and estimates of future profit, so as to allow the purchasers "x" per cent. probable interest per annum, redeeming the capital expended in "y" years.* - - - - - - - - - - -

209. *State what working capital is likely to be needed to enable the mine to produce "x" tons a day; and what the monthly expenditure is likely to amount to.* - - - - - -

**QUESTIONS**—*continued.*

210. *If the mine requires further development before the anticipated profits can be made, state what amount of work will have to be done, what it will cost, and what time will be required to execute it?* - - - - - - - - - - -

211. *If the property has not paid, what reason is assigned for it?* -

212. *The state of repair of the plant generally and the condition of the mine underground ought to be stated.* - - - -

213. *Ascertain all liabilities of any kind chargeable against the property.* - - - - - - - - - - -

214. *Examine titles to mine and mill-sites, water and timber rights, and all contracts relating to the undertaking binding on the vendor and purchaser.* - - - - - - - -

**QUESTIONS**—*continued.*

215. *Maps and plans of the district and of the property, indicating their topographical and geological features, the situation and approaches to the property, position of shafts, mill site, buildings, etc.; and plans and sections of the mine on a working scale, showing the area of the claim or lease, its position in regard to adjoining mines and landmarks, the extent of ground worked out, and the trend of the "ore bodies," are in all cases desirable.* - - - - -

216. *State your general recommendations and conclusions, and what special advantages and drawbacks, if any, there are to the property.* - - - - - - - - - - -

217. *If a "placer-mine," state whether a shallow "placer," "deep lead," or "river deposit."* - - - - - - - -

(A) *Its area or acreage.* - - - - - - - - -

**QUESTIONS**—*continued.*

(B) *The value put upon the gravel or cement per cubic yard, the total quantity the property is estimated to contain, and its probable average yield per acre.* - - - -

(C) *What tests have been made to determine its thickness and value at various points.* - - - - - -

(D) *If such tests have been made, give a plan of the property showing the position of trial pits, borings, etc., and the run and width of any rich "bars" or "leads" that may have been proved to exist; distinguishing between "pay" and barren ground; and give sections of the gravel.* -

(E) *What is the character of the gravel, how is the gold distributed in it, and is the latter coarse or fine? Are there any special minerals associated with it?* - -

**QUESTIONS**—*continued.*

(F) *State if the deposit contains pipe clay, cement, or large boulders, that would in any way hinder its rapid working.* - - - - - - - - - -

(G) *What is the nature and thickness of the overburden?* - -

(H) *What is the nature of the bed-rock and rim-rock?* - -

(I) *Show where the lowest point on the claim is situated.* - -

(J) *State if this lowest point can be connected by a bed-rock tunnel with a good dumping ground.* - - - -

(K) *What length and "grade" would this tunnel have?* - -

(L) *Is there good and sufficient dump room for tailings?* - -

**QUESTIONS**—*continued.*

(M) *What is the length of the season during which the claim can be worked?* - - - - - - - - - -

(N) *What outlay should be estimated for monitors, sluices and under-currents, etc., and what would be the size, weight, cost and number of the former, and the character, disposition, size, length, grade and cost of the appliances used for catching the gold?* - - - - - - -

(O) *What is the present and what is the maximum quantity of water available to hydraulic "the banks," what will it cost to deliver per miner's inch, and where can it be obtained from?* - - - - - - - - - -

(P) *What length of ditch, flume and pipe will be required, and what will these cost to build, lay and keep in repair; give a section of the ground to scale, showing the differences of level, and a plan of the line of route?* -

**QUESTIONS**—*continued.*

(Q) *What size of pipe is estimated to be required; under what head will it deliver the water; and how many "nozzles" will it work during the season ( months), to advantage?*

(R) *With the above facilities taking into consideration the thickness, character and position of the gravel, what acreage can be worked out in a season, and at what gross cost per acre?* - - - - - - - - - -

(S) *What is the duty of a miner's inch in this ground?* - -

(T) *What staff, labour and supplies will be needed to work the property on the scale proposed; and what are the wages rates?* - - - - - - - - - -

**QUESTIONS**—*continued.*

(u) *Will it be necessary to build a storage reservoir or "brushdams" for tailings; are inverted-syphons needed in the pipe-line; and are hydraulic elevators, or any special appliances required to work the gravel?* - - - - -

(v) *Up to date what number of cubic feet of gravel are estimated to have been moved each season, and what has been, and what is likely to be the gross cost and net profit?* - -

(w) *Are there any legal or local restrictions upon hydraulic mining in the district?* - - - - - -

(x) *If a "deep lead" state what system is proposed to work the ground; and whether trouble is likely to be encountered from water; if so, what "pumping plant" will be needed and what will it cost to handle the water?* - - -

**QUESTIONS**—*continued.*

(Y) *If a* "**cement-claim**," *what is the value of the "cement," what crushing machinery will be required; and what will it cost per ton to crush the cement?* - - - -

(Z) *If a* "**river-claim**," *can it be worked by dredging; or is it proposed to dam and divert the stream; and what is the estimated outlay for "plant," dams, &c., to carry out this work?* - - - - - - - - - -

(AA) *What stock of tools, mercury, &c., will be required to equip the works for carrying on operations on the scale proposed; and what is the ground estimated to yield per cubic yard?* - - - - - - - - -

(BB) *Describe the nature of the dredging ground and its value; stating the nature of the bottom, distribution of the gold, its character and minerals associated with it; what class of "dredge" can best be employed; and state what it is likely to cost per cubic yard to dredge the ground* - -

**QUESTIONS**—*continued.*

(CC) *What labour will be required for dredging, and what will it cost to operate a dredge per diem?* - - - -

(DD) *What Capital is needed to thoroughly equip and work the property on the scale proposed?* - - - -

218. *If a* "**tin mine**," *describe the character of the lode; and the quantity of* "**tin-stone**" *produced per annum.* - - -

219. *What proportion of* "**black-tin**" *does the lode yield in lb. per ton?* - - - - - - - - - - -

220. *What proportion of wolfram and other minerals are associated with the tin-stone?* - - - - - - - - -

221 *What system of concentration is used; describe the "dressing machinery," and is "magnetic separation" applicable to the concentrates?* - - - - - - - - - -

## PAN TESTS (GOLD TABLE).

| Weight Washed Gold. 4lb. sample quartz 6lb. ,, gravel | Fineness ·780. Value per oz. $16.12. | Fineness ·830 Value per oz. $17.15. | Fineness ·875 Value per oz. $18.08. | Fineness ·920. Value per oz. $19.01. | Weight Washed Gold. 4lb. sample quartz 6lb. ,, gravel | Fineness ·780. Value per oz. $16·12. | Fineness ·830. Value per oz. $17·15. | Fineness ·875. Value per oz. $18·08. | Fineness ·920. Value per oz. $19·01. |
|---|---|---|---|---|---|---|---|---|---|
| Grains. | $ | $ | $ | $ | Grains. | $ | $ | $ | $ |
| 5 | 83·97 | 89·36 | 94·20 | 99·05 | ·07 | 1·17 | 1·25 | 1·31 | 1·38 |
| 4 | 67·18 | 71·49 | 75·36 | 79 24 | ·06 | 1·00 | 1·07 | 1·13 | 1·18 |
| 3 | 50·38 | 53·61 | 56·52 | 59·43 | ·05 | ·84 | ·89 | ·94 | ·99 |
| 2 | 33·59 | 35·74 | 37·68 | 39·63 | ·04 | ·67 | ·71 | ·75 | ·79 |
| 1 | 16·79 | 17·87 | 18·84 | 19·81 | ·03 | ·50 | ·53 | ·56 | ·59 |
| ·9 | 15·11 | 16·08 | 16·95 | 17·82 | ·02 | ·33 | ·35 | ·37 | ·39 |
| ·8 | 13·43 | 14·29 | 15·07 | 15·84 | ·01 | ·16 | ·17 | ·18 | ·19 |
| ·7 | 11·75 | 12·51 | 13·19 | 13·86 | ·009 | ·15 | ·16 | ·17 | ·18 |
| ·6 | 10·07 | 10·73 | 11·30 | 11·88 | ·008 | ·13 | ·14 | ·15 | ·16 |
| ·5 | 8·40 | 8·93 | 9·42 | 9 90 | ·007 | ·11 | ·12 | ·13 | ·14 |
| ·4 | 6·71 | 7·14 | 7·53 | 7.92 | ·006 | ·10 | ·10 | ·11 | ·11 |
| ·3 | 5·03 | 5·36 | 5·65 | 5·94 | ·005 | ·08 | ·08 | ·09 | ·09 |
| ·2 | 3·36 | 3·57 | 3·76 | 3·96 | ·004 | ·06 | ·06 | ·07 | ·07 |
| ·1 | 1·68 | 1·78 | 1.88 | 1·98 | ·003 | ·05 | ·05 | ·05 | ·05 |
| ·09 | 1·51 | 1·60 | 1·69 | 1·78 | ·002 | ·03 | ·03 | ·03 | ·03 |
| ·08 | 1·34 | 1·42 | 1·50 | 1·58 | ·001 | ·01 | ·01 | ·01 | ·01 |

To determine the value of a cubic yard of gravel, pulverize and wash 60lb., and if this produces 1 grain, the gold being 780 fine, the value of 1 cubic yard would be $1·67, a result obtained by dividing the value given in the table by ten. If 60lb. yield $1\frac{3}{10}$ grains, the fineness of the gold being 920, the value of the gold is ($1·98 + ·39)=$2·37 per cubic yard. The Table is prepared on the supposition that 18 cubic feet of gravel in bank will weigh one ton (2,000 lb.), and a cubic yard or 27 cubic feet will weigh 3,000 lb. or $1\frac{1}{2}$ tons. Consequently 6lb. of gravel is $\frac{1}{1000}$ of the weight of a cubic yard, whilst 4lb. of quartz is $\frac{1}{1000}$ of a ton of 2,000 lb.

NOTE.—For approximate calculation, 1 grain of gold=2d., and 1 dwt.=4/-.

## PANNING TESTS.

(*Supplementing Assays*).

| Number of sample. | Weight in lb. or kilo. | Result in grains or grms. | Remarks. | *Value per ton or cubic yard. | | | |
|---|---|---|---|---|---|---|---|
| | | | | *Oz. | Dwt. | Gr. | *Grm. |
| | | | | £ | s. | d. | $ |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | Averages | | | | |

* Strike out one of these, and state what ton is employed.

## PANNING TESTS—*continued.*

*(Supplementary Assays).*

| Number of sample. | Weight in lb. or kilo. | Result in grains or grms. | Remarks. | *Value per ton or cubic yard. | | | |
|---|---|---|---|---|---|---|---|
| | | | | *Oz. | Dwt. | Gr. | *Grm. |
| | | | | £ | s. | d. | $ |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | Averages | | | | |

*Strike out one of these, and state what ton is employed.

| ANALYSIS. CONSTITUENTS OF ORE. | % |
| --- | --- |

## ANALYSIS.

| CONSTITUENTS OF ORE. | % |
| --- | --- |
| | |

## STATEMENT SHOWING WORK DONE AND COST OF TRUCKING AND HOISTING.

*For the period from* ..... *to* .....

(As per "brace" and "plat" tables.)

| Working Place. | No. of shifts worked. | Tonnage Trucked. | | | Average Tonnage per man per shift. | | Cost per ton. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ore. | | | Ore and mullock. | | | |
| | | Ore. | Mullock. | Total. | Ore trammed. | Ore and mullock. | Labour | Power. (Hoist). | Maintce | Labour | Power. (Hoist). | Maintce | Total. |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

# TABLE

## Showing work done, Stoping on Contract, based on the lineal footage bored.

(Exclusive of Superintendence and general charges.)

| Description of Stope, and Class of Rock. | Party No..... | No. of men per shift of ....hours. | Total number of shifts worked. | Total number of holes bored. | Average depth of each hole. | Footage bored. | | Tons of ore broken. | | Explosives used. Weight. | | Total cost of labour and explosives. | Cost per foot or metre bored. | | | | Cost per ton or cubic metre broken. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Total. | Av. per man per shift. | Total weight. | Av. per man per shift. | Total weight. | Av. per ton of ore broken. | | Labour. | Explosives. | Tools. | Total. | Labour. | Explosives. | Tools. | Total. |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

# TABLE

**Showing Quantity of Ore Broken in Stopes per Man per Shift (exclusive of Superintendence and General Charges) on "day-pay" or "contract" in different kinds of ground.**

| System of Stoping and Nature of Rock to be fully described. | No. of men per shift of .....hours. | No. of Machines. | STOPE :— Quantity of Ore Mined. | Quantity of Mullock broken. | Width of Stope. | Width of Ore. | † Cost of Stoping. Ore. | † Cost of Stoping. Ore and Mullock. | † Cost of "Filling." | † Cost of "Timbering." | † Cost of Tramming to Shaft. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

† Per ton or cubic metre in £ s. d. or $.

# TABLE

**Showing Monthly Progress and the Cost of Development per Metre or Foot in different kinds of grounds (exclusive of Superintendence and General Charges).**

| Working Place and Nature of Rock to be fully Described. | Shaft. | | Cross cut. | | Level. | | Rise or Winze. | | Remarks.‡ |
|---|---|---|---|---|---|---|---|---|---|
| | Progress. | Cost. | Progress. | Cost. | Progress. | Cost. | Progress. | Cost. | |
| | M. Ft. in. | $ cts. £ s. d. | M. Ft. in. | $ cts. £ s. d. | M. Ft. in. | $ cts. £ s. d. | M. Ft. in. | $ cts. £ s. d. | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

‡ State number of men; hand or machine drilling; contract or "day-pay"; "dry" or "wet-ground"; quantity of explosives, steel tools, etc., included in costs; and whether inclusive or exclusive of trucking. If the former, state distance trucked.

# TABLES.

*The numbering of these Tables is the same as in the 1st Edition. They are ruled for money columns of £ s. d., $ and cents., or any decimal coinage can take the place of the latter.*

## Table I.—DISTRIBUTION OF GOLD AND SILVER OR OTHER METAL ( ) IN AN ORE.

| Name of Mineral. | GOLD. Per ton. | | | SILVER. Per ton. | | | Other Metal. °/₀ | REMARKS. (Colour and general character.) |
|---|---|---|---|---|---|---|---|---|
| | oz. | dwt. | gr. | oz. | dwt. | gr. | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| TOTAL ... ... ... ... | | | | | | | | |

## Table II.—SIZING TEST.

*Description of Sample* .....

*Percentage of Ore Crushed* .....

| Product. | % by weight. | Percentage of Metals in Sample. | | | | | | | Assay Value per Ton. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pyrites. | Tin. | Black Tin. | Wolframite. | Lead. | Zinc or other Metal. | Average % of Base Metals. | Gold. | | | Silver. | | |
| | | | | | | | | | Oz. | dwt. | gr. | Oz. | dwt. | gr. |
| Through.....mesh..... | | | | | | | | | | | | | | |
| Between ..... and..... | | | | | | | | | | | | | | |
| ..... | | | | | | | | | | | | | | |
| ..... | | | | | | | | | | | | | | |
| ..... | | | | | | | | | | | | | | |
| ..... | | | | | | | | | | | | | | |
| ..... | | | | | | | | | | | | | | |
| ..... | | | | | | | | | | | | | | |

Table III.—POWER FOR A ..... MILL.

| Description of Machine. | I.H.P. required. |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| Elevators and Conveyors (if any) ... | |
| Loss in transmission ... ... ... | |
| TOTAL ... ... | |

## Table IV.—WEAR OF SHOES AND DIES.

| Name of Mill. | Shoe or Die. | Metal. | Weight. | | Ore crushed during time of service. | Metal worn per ton of ore crushed | Cost of the metal per lb. | Value of the scrap. | Cost per ton of ore crushed. | Total cost per ton of ore crushed, for both shoe and die. |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | New. | Worn out. | | | | | | |
| | | | lb. | lb. | Ton. | Oz. | Pence or Cts. | Pence or Cts. | Pence or Cts. | Pence or Cts. |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

## Table V.—TABLE OF SCREEN SIZES.

| No. of Needle. | Corresponding Mesh. | Width of Slot. | | Gauge of Russian Iron. | Thick. | Thickness of Iron. American Gauge. | Weight per Sheet. | Weight per sq. ft. | Burred Vertical Slots. | | Plain Diagonal Slots. | | Area of Slots ¼in. long. | Punched Screens. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | No. of Slots per | Area of discharge per sq. ft. of screen. | No. of Slots per | Area of discharge per sq. ft. of screen. | | Area of Holes. | No. of Holes per | Area of discharge per sq. ft. of screen. |
| | | In. | m. m. | No. | In. | No. | lb. | lb. | sq. in. | sq. in. | sq. in. | sq. in. | sq. in. | sq. in. | sq. in. | sq. in. |
| 3 | 16 | 0·042 | 1·05 | 16 | 0·036 | 22⅜ | 13¼ | 1·24 | 9·0 | 26·6 | — | — | 0·020 5 | 0·001 32 | 160 | 30·4 |
| 4 | 18 | 0·035 | 0·875 | 15 | 0·036 | 22⅜ | 13¼ | 1·24 | 9·5 | 23·9 | — | — | 0·017 5 | 0·000 96 | 160 | 22·1 |
| 5 | 20 | 0·029 | 0·75 | 14 | 0·034 | 23½ | 12½ | 1·15 | 9·5 | 19·8 | 12·0 | 25·0 | 0·014 5 | 0·000 66 | 200 | 19·0 |
| 6 | 25 | 0·027 | 0·675 | 13 | 0·029 | 24 | 11⅝ | 1·08 | 10·5 | 20·4 | 12·0 | 23·3 | 0·013 5 | 0·000 57 | 200 | 16·4 |
| 7 | 30 | 0·024 | 0·60 | 12 | 0·025 | 24½ | 10⅝ | 0·978 | 10·5 | 18·1 | 12·0 | 20·7 | 0·012 | 0·000 45 | 240 | 15·6 |
| 8 | 35 | 0·022 | 0·55 | 11 | 0·023 | 25 | 10 | 0·918 | 11·0 | 17·4 | 12·0 | 19·0 | 0·011 | 0·000 38 | 240 | 13·1 |
| 9 | 40 | 0·020 | 0·50 | 10 | 0·020 | 26 | 9 | 0·827 | 11·0 | 15·8 | 12·0 | 17·3 | 0·010 | 0·000 31 | 300 | 13·4 |
| 10 | 50 | 0·018 | 0·45 | 9 | 0·018 | 27 | 8 | 0·735 | 11·0 | 14·3 | 12·5 | 16·2 | 0·090 | 0·000 25 | 300 | 10·8 |
| 11 | 55 | 0·016 | 0·413 | 8 | 0·016 | 28 | 7½ | 0·666 | 11·0 | 12·7 | 12·5 | 14·4 | 0·080 | 0·000 20 | 360 | 10·4 |
| 12 | 60 | 0·015 | 0·375 | 8 | 0·016 | 28 | 7½ | 0·666 | 11·0 | 11·9 | 12·5 | 13·5 | 9·075 | 0·000 18 | 360 | 9·3 |

NOTE.—Refer to recommendations of the Standardization Committee of the Inst. of Mining and Metallurgy, 1907; "Useful Memoranda," at end of this book; and also to the "Paper" by Geo. T. Holloway on "Sieve and Screen Apertures," Bulletin No. 5 of the Inst. of Mining and Metallurgy.

## Ya.—WOVEN WIRE SCREENS.*

| Mesh Number. | Number of Meshes per square inch. | Gauge of Wire. | Thickness of Wire. | Width of Mesh. | | Area af each Mesh. | Discharge Area per square foot of screen. |
|---|---|---|---|---|---|---|---|
| | | | | Inches. | Millimetres. | square inch. | square inch. |
| 12 | 144 | 22 B.W.G. | 0·028 | 0·055 | 1·39 | 0·003 03 | 62·8 |
| 14 | 196 | 24 | 0·022 | 0·049 | 1·24 | 0 002 40 | 67·8 |
| 16 | 256 | 25 | 0·020 | 0·042 | 1·06 | 0·001 76 | 65·1 |
| 18 | 324 | 26 | 0·018 | 0·037 | 0·93 | 0·001 37 | 63·9 |
| 20 | 400 | 28 | 0·014 8 | 0·035 | 0·88 | 0·001 23 | 70·6 |
| 22 | 484 | 29 | 0·013 6 | 0·032 | 0·81 | 0·001 02 | 71·4 |
| 24 | 576 | 31 | 0·011 6 | 0·030 | 0·76 | 0·000 90 | 74·6 |
| 27 | 729 | 33 | 0·010 0 | 0·027 | 0·68 | 0·000 73 | 76·5 |
| 30 | 900 | 34 | 0·009 2 | 0·024 | 0·61 | 0·000 58 | 74·7 |
| 32 | 1,024 | 34 | 0·009 2 | 0·222 | 0.55 | 0·000 48 | 71·4 |
| 35 | 1,225 | 35 | 0·008 4 | 0·020 | 0·50 | 0·000 40 | 70 6 |
| 40 | 1,600 | 36 | 0·007 6 | 0·017 | 0·43 | 0 000 29 | 66·6 |
| 45 | 2,025 | 37 | 0·006 8 | 0·015 | 0·38 | 0·000 23 | 65·6 |
| 50 | 2,500 | 37 | 0·006 8 | 0·013 | 0·33 | 0·000 17 | 60·8 |
| 55 | 3,025 | 37 | 0·006 8 | 0·011 | 0·28 | 0·000 12 | 52·7 |
| 60 | 3,600 | 37 | 0·006 8 | 0·010 | 0·25 | 0 000 10 | 51·8 |

* From a Table by Henry Louis in "Gold Milling," p. 128.

## Table VI.—WEAR OF SCREENS.

| Name of Mill. | Description of Screen. | Mesh. | Wear in Days. | Tons Crushed. |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## Table VII.—AMALGAMATION OF ..... .....TONS OF CONCENTRATES.

| | Assay Value per Ton. | | | Contents based on Assay of each Pan Charge. | | | Percentage of Extraction. | Loss of Mercury per Ton. |
|---|---|---|---|---|---|---|---|---|
| | Gold. oz. dwt. gr. | Silver. oz. dwt. gr. | Total. oz. dwt. gr. | Gold. oz. dwt. gr. | Silver. oz. dwt. gr. | Total. oz. dwt. gr. | By Assay. | oz. |
| Concentrates ... | | | | | | | | |
| Tailings ... ... | | | | | | | | |
| Assay difference .. | | | | | | | | |
| Actual Bullion Returns ... | Actually extracted per ton of ore. | | | | | | Actual extraction. | |
| | Actually contained in tailings per ton of ore. | | | | | | | |

## Table VIII.—GOLD MILLING COSTS.

*Locality where situated* .....

*Name of Mill* .....

*No. of Stamps* .....

*Year in which return was made* .....

*Time crushing lasted* .....

*Tons crushed* .....

| | | $ cts. or £ s. d. |
|---|---|---|
| *Labour, per ton* ... | *Engines and Boilers* | |
| | *Rock-breaker* | |
| | *Stamps* | |
| | *Concentrators* | |
| | *Tube-Mills* | |
| *Supplies* ... ... ... ... ... ... ... | | |
| *Carried forward* ... ... ... | | |

| | | $ cts. £ s. d. |
|---|---|---|
| *Brought forward* ... ... ... | | |
| *Fuel* ... ... ... ... ... ... ... ... | | |
| *Repairs and Maintenance* ... ... ... | | |
| *Handling* ... ... ... ... ... ... ... | | |
| *Water* ... ... ... ... ... ... ... | | |
| *Lighting* ... ... ... ... ... ... ... | | |
| *Assaying* ... ... ... ... ... ... ... | | |
| *Power cost per ton, using as motive power* ... ... ... | *Water* | |
| | *Steam* | |
| | *Water and Steam* | |
| | *Electric power* | |
| | *Gas engines* | |
| *Total cost* ... ... ... | | |

## Table IX.—MINE WAGES.†

| No. of Men. | Occupation. | Length of Shift. Hours. | Wages per shift. s. d. | Wages per shift. $ cts. |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Total ..... | | | | |

†Rates of white and native labour to be given.

## Table IXa.—MILL WAGES.†

*Name of Mill* .....

*Locality* .....

*Capacity and Class of Mill or Works* .....

| No. of Men. | Occupation. | Length of Shift. Hours. | Wages per Shift. s. d. | Wages per Shift. $ cts. |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Total | | | | |

† Rates of white and native labour to be given.

## Table X.—GOLD MILL RETURNS.

| District. | Average contents of the ore. | Average Milling Costs. | Average Number of Stamps. | Weight of Stamps. | No. of Drops per minute. | Height of Drop. | Depth of Discharge. | Crushing capacity per Stamp. | Capacity of Mill per 24 hours. | Variety of Screen. | Number of holes per square inch. | Wear. | Percentage of Concentrates. | Average gold contents. | Retort percentage. | Fineness of Bullion. | Loss of Mercury per ton of Ore. | Consumption of Water per Stamp per minute. | Total Consumption of Water in the Mill. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dwt. | s. d. $ or cts. | | lb. | | In. | In. | Tons. | Tons. | | | Days. | | Dwt. | | Per 1000. | Oz. | Gal. | Gal. | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | |

## Table XI.—GOLD SAVING.

| Gold Percentage. | | Silver Percentage. | Total Bullion. |
|---|---|---|---|
| † oz. dwt. gr. | | † oz. dwt. gr. | † oz. dwt. gr. |
| | Saved by Amalgamation { inside "mortar box"... ... | | |
| | Saved by Amalgamation { outside do. ... ... | | |
| | Saved by Concentration ... ... ... ... ... | | |
| | Saved by "Cyanide," Pan or other Method { Sands ... | | |
| | Saved by "Cyanide," Pan or other Method { Slimes ... | | |
| Total... | | Total... | Total... |

† Note.—The better practice would be to give these figures in ounces and decimals of an ounce; as recommended by the Institution of Mining and Metallurgy.

## Table XII.—TRIAL CRUSHING.—RESULTS.

| ——— | Total Gold contents calculated by assay. | Total Gold contents by estimate. | Total Gold actually obtained or accounted for. |
|---|---|---|---|
| ……*tons of ore assaying*…… ……*oz. per ton contain* X…… | Oz. | Oz. | Oz. |
| Gold obtained from stamp boxes … … … … … | | | |
| Gold in ore discharged from the battery … … … … | | | |
| Gold obtained from copper plates … … … … … | | | |
| Gold in the pulp after passing over the plates … … … | | | |
| Gold obtained from "wells" … … … … … … | | | |
| Gold in the pulp after passing the "wells" … … … | B | | |
| Gold obtained from pans … … … … … … | | | A |
| Gold in sludge (pan tailings) … … … … … | | | A |
| Gold obtained from "settlers" or concentrating-machines … | | | A |
| Gold in "settlings" in catch-pits … … … … … | | | A |
| Gold in tailings of concentrators … … … … … | | | A |
| Gold in tailings of settling-pits and unaccounted for … … | | | A |
| | | | Y |

NOTE.—The sum of the results marked A should agree with the Assay B.
The Assay X should correspond with the total result Y.

The second column is filled in by deducting the Gold actually obtained, in the different steps of the process, from the total Gold contents of the ore as shown by the preceding assay, and the results estimated in this way should check with the corresponding assay calculation.

## Table XIII.—AMALGAM SAVING.

| Weight. | Representing | — | Retorted. | Representing |
|---|---|---|---|---|
| Oz. | per cent. | | Oz. | per cent |
| | | Caught in the battery ... ... ... ... ... ... | | |
| | | Caught on "plates" outside ... ... ... ... ... | | |
| | | Caught in wells or "riffles" † ... ... ... ... ... | | |
| | | Caught in "mercury-traps" ... ... ... ... ... | | |
| | | Caught in "concentrators" ... ... ... ... ... | | |
| | | Caught in "pans," "barrels" or other appliances ... ... | | |
| TOTAL ... | | Total weight of base-bullion ... ... ... ... | | |

† Seldom used.

## Table XIV.—CONSUMPTION OF MERCURY.

| Name of Mill. | Loss Per Ton of Ore. | | | Arrangement of "Plates" or other Amalgam Savers. |
|---|---|---|---|---|
| | oz. | oz. | oz. | |
| | | *to* | *average* | |
| | | " | " | |
| | | " | " | |
| | | " | " | |
| | | " | " | |
| | | " | " | |

## TABLE XV.—HUNTINGTON MILL.

| | Gross Cost. | | | | Cost per ton. | | | |
|---|---|---|---|---|---|---|---|---|
| | £ | s. | d. | $ cts. | £ | s. | d. | $ cts. |
| Power { Labour | | | | | | | | |
| Power { Fuel | | | | | | | | |
| Labour of Tending and Feeding, Cleaning-up, and Superintendence | | | | | | | | |
| Water for Mills and Rock-breaker | | | | | | | | |
| Shoes | | | | | | | | |
| Dies | | | | | | | | |
| Caps, Scrapers, and Bolts | | | | | | | | |
| Renewals of other Working Parts | | | | | | | | |
| Mercury | | | | | | | | |
| Oil (illuminating and lubricating) for Mills and Breaker | | | | | | | | |
| Depreciation | | | | | | | | |
| Cost of Milling per ton | | | | | | | | |
| Labour at Breaker | | | | | | | | |
| Wear and Tear at Breaker | | | | | | | | |
| Total cost per ton | | | | | | | | |

**Table XVI.—BARREL CHLORINATION.**—*Quantity treated* ..... *ton in* ..... *days* ..... *hrs. Extraction* ..... %

BREAKING AND ROASTING ..... Tons of Ore.

| — | Gross Cost. | Cost per Ton. |
|---|---|---|
| | $ cts. £ s. d. | $ cts. £ s. d. |
| Labour { Motors ..... men @ ..... = | | |
| Labour { Furnaces ..... ,, ..... = | | |
| Fuel ..... cords @ ..... = | | |
| Salt ... ... ... ... ... ... | | |
| Water for boiler ... ... ... ... | | |
| Light ... ... ... ... ... ... | | |
| Repairs ... ... ... ... ... | | |
| Total cost *ex* redemption and interest ... | | |

CHLORINATING ..... Tons of Ore.

| — | Gross Cost. | Cost per Ton. |
|---|---|---|
| | $ cts. £ s. d. | $ cts. £ s. d. |
| Labourers ..... men @ ..... = | | |
| Chlorinators ..... men @ ..... = | | |
| Bleaching Powder ..... lb. @ ..... = | | |
| Sulph. Acid ..... lb. @ ..... = | | |
| Repairs, wear and wear ... ... = | | |
| Power ... ... ... ... ... = | | |
| Extras ... ... ... ... ... = | | |

**Table XVII.—VAT CHLORINATION.**—*Quantity treated* ..... *tons in* ..... *days* ..... *hrs.* ..... *Extraction* ..... %

| — | Gross cost. $ cts. £ s. d. | Cost per ton. $ cts. £ s. d. |
|---|---|---|
| LABOUR:— | | |
| Foremen ... ... ... ... | | |
| Engineers and Foremen ... ... | | |
| Gas Generator ... ... ... | | |
| Salters ... ... ... ... | | |
| Floormen ... ... ... ... | | |
| Roasters ... ... ... ... | | |
| Carmen ... ... ... ... | | |
| Carpenters ... ... ... ... | | |
| Labourers (white) ... ... ... | | |
| „ (native)... ... ... | | |
| Teamsters ... ... ... ... | | |
| Total cost ex interest and redemption | | |

| — | Gross cost. $ cts. £ s. d. | Cost per ton. $ cts. £ s. d. |
|---|---|---|
| SUPPLIES:— | | |
| Acid ... ... ... ... ... | | |
| Wood ... ... ... ... ... | | |
| Coal ... ... ... ... ... | | |
| Furnace Supplies ... ... ... | | |
| Manganese ... ... ... ... | | |
| Sulphate of Iron or other precipitant | | |
| Salt ... ... ... ... ... | | |
| Pipe ... ... ... ... ... | | |
| Generator Fittings ... ... ... | | |
| Leaching Tanks ... ... ... | | |
| Miscellaneous ... ... ... ... | | |
| Repair a/c ... ... ... ... | | |
| Light a/c ... ... ... ... | | |
| Haulage a/c ... ... ... ... | | |
| Extras ... ... ... ... ... | | |

**Table XVIII.—CYANIDE PROCESS.**—(*Quantity of* { **Ore* / *Tailings* { *Sands* / *Slimes* } / *% Concentrates* } *treated,* ..... *tons in* ..... *days* ..... *hrs.* .....

*Percentage of extraction* = .....

| | Per Ton. £ $ s. cts. d. |
|---|---|
| *Superintendence* ..... | |
| *Labour* { *Power* ..... *Shifts per* ..... *hours* ..... *day and* ..... *night*) | |
| *Labour* { *Cyaniding* ..... *Shifts per* ..... *hours* ..... *day and* ..... *night*) | |
| *Supplies* ..... | |
| *Repairs* ..... | |
| *Fuel* ..... | |
| *Potassium Cyanide* *lb. per ton, at* ..... *per lb.* | |
| *Zinc* ..... *lb. per ton, at* ..... *per lb.* | |
| *Electro-deposition* ..... | |
| *Freight* ..... | |
| *Incidentals* (*Assaying, Melting, etc.*) ..... | |
| *Total Cost ex Redemption and Interest* ..... | |

NOTE.—Capacity of vats of different area, see Tables "Cyanide Practice," by Alfred James.
* Three of these to be struck out.

**Table XVIII.—CYANIDE PROCESS.**—(*Quantity of* { **Ore* / *Tailings* { *Sands* / *Slimes* } / *% Concentrates* } *treated,.....tons in.....days.....hrs.....*

*Percentage of extraction =* .....

| | Per Ton. £ $ s. cts. d. |
|---|---|
| *Superintendence* | |
| *Labour* { *Power.....Shifts per.....hours.....day and.....night)* | |
| *Labour* { *Cyaniding.....Shifts per.....hours.....day and.....night)* | |
| *Supplies* | |
| *Repairs* | |
| *Fuel* | |
| *Potassium Cyanide.....lb. per ton, at.....per lb.* | |
| *Zinc.....lb. per ton, at.....per lb.* | |
| *Electro-deposition* | |
| *Freight* | |
| *Incidentals (Assaying, Melting, etc.)* | |
| *Total Cost ex Redemption and Interest* | |

NOTE.—Capacity of vats of different area, see Tables "Cyanide Practice," by Alfred James.
* Three of these to be struck out.

**Table XVIII.—CYANIDE PROCESS.**—(*Quantity of* { **Ore* / *Tailings* { *Sands* / *Slimes* } / *% Concentrates* } *treated,* ..... *tons in* ..... *days* ..... *hrs.*

*Percentage of extraction* = .....

| | Per Ton. £ $ s. cts. d. |
|---|---|
| *Superintendence* ..... | |
| *Labour* { *Power* ..... *Shifts per* ..... *hours* ..... *day and* ..... *night)* ..... | |
| *Labour* { *Cyaniding* ..... *Shifts per* ..... *hours* ..... *day and* ..... *night)* ..... | |
| *Supplies* ..... | |
| *Repairs* ..... | |
| *Fuel* ..... | |
| *Potassium Cyanide* ..... *lb. per ton, at* ..... *per lb.* ..... | |
| *Zinc* ..... *lb. per ton, at* ..... *per lb.* ..... | |
| *Electro-deposition* ..... | |
| *Freight* ..... | |
| *Incidentals (Assaying, Melting, etc.)* ..... | |
| *Total Cost ex Redemption and Interest* ..... | |

NOTE.—Capacity of vats of different area, see Tables "Cyanide Practice," by Alfred James.
* Three of these to be struck out.

**Table XVIII.—CYANIDE PROCESS.**—(*Quantity of* { **Ore* / *Tailings* { *Sands* / *Slimes* } / *% Concentrates* } *treated,* _____ *tons in* _____ *days* _____ *hrs.* _____

*Percentage of extraction* = _____

| | Per Ton. £ $ s. cts. d. |
|---|---|
| *Superintendence* | |
| *Labour* { *Power* ... *Shifts per* ____ *hours* ... *day and* ____ *night*) | |
| *Labour* { *Cyaniding* ... *Shifts per* ____ *hours* ... *day and* ____ *night*) | |
| *Supplies* | |
| *Repairs* | |
| *Fuel* | |
| *Potassium Cyanide* ... *lb. per ton, at* ____ *per lb.* | |
| *Zinc* ... *lb. per ton, at* ____ *per lb.* | |
| *Electro-deposition* | |
| *Freight* | |
| *Incidentals (Assaying, Melting, etc.)* | |
| *Total Cost ex Redemption and Interest* | |

NOTE.—Capacity of vats of different area, see Tables "Cyanide Practice," by Alfred James.
* Three of these to be struck out.

## Table XIX.—CYANIDE PROCESS.

| | "Ore." | "Sands." | "Slimes." | "Concentrates" |
|---|---|---|---|---|
| Duration of run (days) ... ... ... ... ... ... ... ... ... | | | | |
| Water in Tailings (per cent.) ... ... ... ... ... ... ... ... | | | | |
| Dry weight of tailings leached (tons) ... ... ... ... ... ... ... | | | | |
| Weight of tailings leached (per day) ... ... ... ... ... ... ... | | | | |
| Sizing test average:— | | | | |
| Passing through -mesh (per cent.) ... ... ... ... ... ... | | | | |
| Remaining on „ (per cent.) ... ... ... ... ... ... | | | | |
| Average leaching rate per hour (inches) ... ... ... ... ... ... | | | | |
| Precipitate after acid treatment (No. of oz.) ... ... ... ... ... ... | | | | |
| Weight of bullion obtained (No. of bars and No. of oz.) ... ... ... ... | | | | |
| „ precipitate shipped (oz.) ... ... ... ... ... ... ... | | | | |
| Total quantity of fine gold obtained (oz.) ... ... ... ... ... ... | | | | |
| „ „ „ silver „ (oz.) ... ... ... ... ... ... | | | | |
| Cyanide consumed per oz. of precious metals recovered (lb.) ... ... ... | | | | |
| Zinc „ „ „ „ (lb.) ... ... ... | | | | |
| Strength of cyanide solution ... ... ... ... ... ... ... ... | | | | |

## Table XIXa.—CYANIDE PROCESS—*continued.*

| | | Gold. Oz. | Gold. Dwt. | Silver. Oz. | Silver. Dwt. | Remarks. |
|---|---|---|---|---|---|---|
| Assay of tailings (per ton) | Sands | | | | | |
| | Slimes | | | | | |
| „ leached tailings | Sands | | | | | |
| | Slimes | | | | | |
| Extraction called for | Sands | | | | | |
| | Slimes | | | | | |
| „ obtained | Sands | | | | | |
| | Slimes | | | | | |
| „ „ (per cent.) | Sands | | | | | |
| | Slimes | | | | | |

| | | Gold. £ | Gold. s. | Gold. d. | Silver. $ | Silver. cts. | Silver. £ | Silver. s. | Silver. d. |
|---|---|---|---|---|---|---|---|---|---|
| Value of tailings (per ton) | Sands | | | | | | | | |
| | Slimes | | | | | | | | |
| Extraction value obtained (per ton) | Sands | | | | | | | | |
| | Slimes | | | | | | | | |
| Average fineness of bullion (per 1000) | Sands | | | | | | | | |
| | Slimes | | | | | | | | |
| „ value of „ (per oz.) | Sands | | | | | | | | |
| | Slimes | | | | | | | | |

Table XIXb.—CYANIDE PROCESS—SUPPLIES, etc., CONSUMED.—*continued.*

| | lb. | Gross Cost. £ $ s. cts. d. | lb. per Ton. | Cost per Ton. |
|---|---|---|---|---|
| Cyanide ... ... ... ... ... ... ... ... | | | | |
| Zinc ... ... ... ... ... ... ... ... | | | | |
| Lime ... ... ... ... ... .. ... ... | | | | |
| Sulphuric Acid ... ... ... ... ... ... ... | | | | |
| Other Chemicals ... ... ... ... ... ... | | | | |
| Fuel ... ... ... ... ... ... ... ... | | | | |
| Miscellaneous (Supplies) ... ... ... ... ... | | | | |
| Totals ... ... ... ... | | | | |

## Table XIXc.—CYANIDE PROCESS—COST OF TREATMENT—*continued.*

| | Gross Cost. £ | Gross Cost. $ cts. | Cost per Ton. £ s. d. | Cost per Ton. $ cts. |
|---|---|---|---|---|
| Labour { Power, Filling Vats, Cyaniding, Discharging Vats } | | | | |
| Chemicals | | | | |
| Fuel | | | | |
| Miscellaneous (Supplies) | | | | |
| TOTALS | | | | |

## VALUE OF BULLION PRODUCTS.

| | Gold. £ s. d. | Gold. $ cts. | Silver. £ s. d. | Silver. $ cts. | Total. £ s. d. | Total. $ cts. |
|---|---|---|---|---|---|---|
| Bar bullion | | | | | | |
| Precipitate shipped | | | | | | |
| Slag „ | | | | | | |

**Table XVIII.—CYANIDE PROCESS.**—(*Quantity of* { **Ore* / *Tailings* { *Sands* / *Slimes* } / *% Concentrates* } *treated,* ..... *tons in* ..... *days* ..... *hrs.* .....

*Percentage of extraction* = .....

| | Per Ton. £ $ s. cts. d. |
|---|---|
| *Superintendence* ..... | |
| *Labour* { *Power* ..... *Shifts per* ..... *hours* ..... *day and* ..... *night)* ..... | |
| *Labour* { *Cyaniding* ..... *Shifts per* ..... *hours* ..... *day and* ..... *night)* ..... | |
| *Supplies* ..... | |
| *Repairs* ..... | |
| *Fuel* ..... | |
| *Potassium Cyanide* ..... *lb. per ton, at* ..... *per lb.* ..... | |
| *Zinc* ..... *lb. per ton, at* ..... *per lb.* ..... | |
| *Electro-deposition* ..... | |
| *Freight* ..... | |
| *Incidentals (Assaying, Melting, etc.)* ..... | |
| *Total Cost ex Redemption and Interest* ..... | |

NOTE.—Capacity of vats of different area, see Tables "Cyanide Practice," by Alfred James.
* Three of these to be struck out.

**Table XVIII.—CYANIDE PROCESS.**—(*Quantity of* { **Ore* / *Tailings* ( *Sands* / *Slimes* ) / *% Concentrates* } *treated,*.....*tons in*.....*days*.....*hrs.*.....

*Percentage of extraction* = .....

| | Per Ton. £ $ s. cts. d. |
|---|---|
| *Superintendence* ..... | |
| *Labour* { *Power*..... *Shifts per*.....*hours*.....*day and*.....*night*) ..... | |
| *Labour* { *Cyaniding*..... *Shifts per*.....*hours*.....*day and*.....*night*) ..... | |
| *Supplies* ..... | |
| *Repairs* ..... | |
| *Fuel* ..... | |
| *Potassium Cyanide* .....*lb. per ton, at*.....*per lb.*..... | |
| *Zinc* .....*lb. per ton, at*.....*per lb.*..... | |
| *Electro-deposition* ..... | |
| *Freight* ..... | |
| *Incidentals (Assaying, Melting, etc.)*..... | |
| *Total Cost ex Redemption and Interest* ..... | |

NOTE.—Capacity of vats of different area, see Tables "Cyanide Practice," by Alfred James.
* Three of these to be struck out.

## Table XIX.—CYANIDE PROCESS.

| | "Ore." | "Sands." | "Slimes." | "Concentrates" |
|---|---|---|---|---|
| Duration of run (days) ... ... ... ... ... ... ... ... ... | | | | |
| Water in Tailings (per cent.) ... ... ... ... ... ... ... ... | | | | |
| Dry weight of tailings leached (tons) ... ... ... ... ... ... ... | | | | |
| Weight of tailings leached (per day) ... ... ... ... ... ... ... | | | | |
| Sizing test average :— | | | | |
| Passing through -mesh (per cent.) ... ... ... ... ... ... | | | | |
| Remaining on „ (per cent.) ... ... ... ... ... ... | | | | |
| Average leaching rate per hour (inches) ... ... ... ... ... ... | | | | |
| Precipitate after acid treatment (No. of oz.) ... ... ... ... ... ... | | | | |
| Weight of bullion obtained (No. of bars and No. of oz.) ... ... ... ... | | | | |
| „ precipitate shipped (oz.) ... ... ... ... ... ... ... | | | | |
| Total quantity of fine gold obtained (oz.) ... ... ... ... ... ... | | | | |
| „ „ „ silver „ (oz.) ... ... ... ... ... ... | | | | |
| Cyanide consumed per oz. of precious metals recovered (lb.) ... ... ... | | | | |
| Zinc „ „ „ „ (lb.) ... ... ... | | | | |
| Strength of cyanide solution ... ... ... ... ... ... ... ... | | | | |

## Table XIXa.—CYANIDE PROCESS—*continued.*

| | | Gold. Oz. Dwt. | Silver. Oz. Dwt. | Remarks. |
|---|---|---|---|---|
| Assay of tailings (per ton) | Sands ... ... | | | |
| | Slimes ... ... | ..... | ..... | |
| „ leached tailings ... | Sands ... ... | | | |
| | Slimes ... ... | ..... | ..... | |
| Extraction called for ... | Sands ... ... | | | |
| | Slimes ... ... | ..... | ..... | |
| „ obtained ... ... | Sands ... ... | | | |
| | Slimes ... ... | ..... | ..... | |
| „ „ (per cent.) | Sands ... ... | | | |
| | Slimes ... ... | ..... | ..... | |
| | | ... | ... | ... |
| | | Gold. £ s. d. $ cts. | Silver. £ s. d. $ cts. | |
| Value of tailings (per ton) ... ... | Sands | | | |
| | Slimes | ..... | ..... | |
| Extraction value obtained (per ton) ... | Sands | | | |
| | Slimes | ..... | ..... | |
| Average fineness of bullion (per 1000) | Sands | | | |
| | Slimes | ..... | ..... | |
| „ value of „ (per oz.) | Sands | | | |
| | Slimes | ..... | ..... | |
| | | ... | ... | ..... |

## Table XIXb.—CYANIDE PROCESS—SUPPLIES, etc., CONSUMED.—*continued.*

| | lb. | Gross Cost. £ s. d. / $ cts. | lb. per Ton. | Cost per Ton. |
|---|---|---|---|---|
| Cyanide ... ... ... ... ... ... ... ... | | | | |
| Zinc ... ... ... ... ... ... ... ... | | | | |
| Lime ... ... ... ... ... .. ... ... | | | | |
| Sulphuric Acid ... ... ... ... ... ... ... | | | | |
| Other Chemicals ... ... ... ... ... ... | | | | |
| Fuel ... ... ... ... ... ... ... ... | | | | |
| Miscellaneous (Supplies) ... ... ... ... ... | | | | |
| Totals ... ... ... ... | | | | |

## Table XIXc.—CYANIDE PROCESS—COST OF TREATMENT—*continued.*

| | Gross Cost. £ | Gross Cost. $ cts. | Gross Cost. £ s. d. | Cost per Ton. £ | Cost per Ton. $ cts. | Cost per Ton. £ s. d. |
|---|---|---|---|---|---|---|
| Labour { Power, Filling Vats, Cyaniding, Discharging Vats } ... ... ... ... ... | | | | | | |
| Chemicals ... ... ... ... ... ... ... ... ... ... ... | | | | | | |
| Fuel ... ... ... ... ... ... ... ... ... ... ... | | | | | | |
| Miscellaneous (Supplies) ... ... ... ... ... ... ... ... | | | | | | |
| TOTALS ... ... | | | | | | |

## VALUE OF BULLION PRODUCTS.

| | Gold. £ | Gold. $ cts. | Gold. £ s. d. | Silver. £ | Silver. $ cts. | Silver. £ s. d. | Total. £ | Total. $ cts. | Total. £ s d. |
|---|---|---|---|---|---|---|---|---|---|
| Bar bullion ... ... ... ... ... ... ... ... ... ... | | | | | | | | | |
| Precipitate shipped ... ... ... ... ... ... ... ... ... | | | | | | | | | |
| Slag ,, ... ... ... ... ... ... ... ... ... | | | | | | | | | |

## Table XIXd.—CYANIDING.

### (A Sulphide Ore).

### Roasted.

| | |
|---|---|
| Tons treated ... ... ... ... ... | |
| Yield per ton, oz. ... ... ... ... | |
| Value per oz. ... ... ... ... ... | |
| Value per ton ... ... ... ... ... | |
| Total value ... ... ... ... ... | |
| Bullion produced, oz. ... ... ... ... | |
| Fine gold ... ... ... ... ... | |
| Standard gold ... ... ... ... ... | |
| Fine silver ... ... ... ... ... | |
| Cost per oz. ... ... ... ... ... | |

| | Expenditure. | | | Cost per ton. | | |
|---|---|---|---|---|---|---|
| | £ | $ cts. s. | d. | | s. | $ d. |
| Superintendence ... ... ... | | | | | | |
| Electric light maintenance ... | | | | | | |
| Assaying, retorting and melting | | | | | | |
| Fuel ... ... ... ... ... | | | | | | |
| Water ... ... ... ... | | | | | | |
| Compressed air ... ... ... | | | | | | |
| Filling and emptying vats ... | | | | | | |
| Zinc ... ... ... ... ... | | | | | | |
| Cyanide of Potassium ... ... | | | | | | |
| Separation ... ... ... ... | | | | | | |
| General repairs ... ... ... | | | | | | |
| Labour, general ... ... ... | | | | | | |
| Chemicals ... ... ... ... | | | | | | |
| General stores and charges ... | | | | | | |
| Filling and emptying presses ... | | | | | | |
| Filter-cloth ... ... ... ... | | | | | | |
| Engine-driving and firing ... | | | | | | |
| Firing roasters ... ... ... | | | | | | |
| Agitation ... ... ... ... | | | | | | |

## Table XIXe.—CYANIDING.

### (A Sulphide Ore).

### Raw.

| | |
|---|---|
| Tons treated ... ... ... ... ... | |
| Yield per ton, oz. ... ... ... ... | |
| Value per oz. ... ... ... ... ... | |
| Value per ton ... ... ... ... ... | |
| Total value ... ... ... ... ... | |
| Bullion produced, oz. ... ... ... ... | |
| Fine gold ... ... ... ... ... | |
| Standard gold ... ... ... ... ... | |
| Fine silver ... ... ... ... ... | |
| Cost per oz. ... ... ... ... ... | |

| | Expenditure. £ | s. | d. | $ cts. | Cost per ton. s. | d. |
|---|---|---|---|---|---|---|
| Superintendence ... ... ... | | | | | | |
| General stores and charges ... | | | | | | |
| Electric light maintenance ... | | | | | | |
| Assaying, retorting and melting | | | | | | |
| Fuel ... ... ... ... ... | | | | | | |
| Water ... ... ... ... | | | | | | |
| Labour, general ... ... ... | | | | | | |
| Engine-driving and firing ... | | | | | | |
| General repairs ... ... ... | | | | | | |
| Screens, shoes and dies ... ... | | | | | | |
| Elevating ... ... ... ... | | | | | | |
| Bromo-cyanide ... ... ... | | | | | | |
| Cyanide of potassium ... ... | | | | | | |
| Filling and emptying presses ... | | | | | | |
| Compressed air ... ... ... | | | | | | |
| Zinc ... ... ... ... ... | | | | | | |
| Chemicals ... ... ... ... | | | | | | |
| Filter-cloth... ... ... ... | | | | | | |
| Royalty ... ... ... ... | | | | | | |

## Table XIXf.—CYANIDING.

### (Sands treatment).

| | |
|---|---|
| Tons treated ... ... ... ... ... | |
| Bullion produced, oz. ... ... ... ... | |
| Fine gold ... ... ... ... ... | |
| Standard gold ... ... ... ... ... | |
| Fine silver ... ... ... ... ... | |
| Yield per ton ... ... ... ... ... | |
| Total value ... ... ... ... ... | |
| Value per ton ... ... ... ... ... | |
| Value per oz. ... ... ... ... ... | |
| Cost per oz. ... ... ... ... ... | |

| | Expenditure. | | | Cost per ton. | | |
|---|---|---|---|---|---|---|
| | £ | $ s. | cts. d. | s. | $ d. | |
| Superintendence ... ... ... | | | | | | |
| Solutions, pumping, etc. ... ... | | | | | | |
| Filling and emptying vats ... | | | | | | |
| Engine-driving, firing, etc. ... | | | | | | |
| Turning zinc ... ... ... | | | | | | |
| Assaying and retorting, etc. ... | | | | | | |
| Extension of tramways & repairs | | | | | | |
| Zinc ... ... ... ... ... | | | | | | |
| Fuel ... ... ... ... ... | | | | | | |
| Water, salt ... ... ... ... | | | | | | |
| Water, fresh ... ... ... | | | | | | |
| Lime and chloride of lime ... | | | | | | |
| Cyanide ... ... ... ... | | | | | | |
| Electric light ... ... ... | | | | | | |
| General repairs and maintenance | | | | | | |
| Breaking slimes and sands ... | | | | | | |
| Re-handling sands from dump ... | | | | | | |
| Realization charges ... ... | | | | | | |

## Table XIXg.—CYANIDING.

### (Slimes treatment.)

| | |
|---|---|
| Tons treated ... ... ... ... ... | |
| Bullion produced, oz. ... ... ... ... | |
| Fine gold ... ... ... ... ... | |
| Standard gold ... ... ... ... ... | |
| Fine silver ... ... ... ... ... | |
| Yield per ton ... ... ... ... ... | |
| Total value ... ... ... ... ... | |
| Value per ton ... ... ... ... ... | |
| Value per oz. ... ... ... ... ... | |
| Cost per oz. ... ... ... ... ... | |

| | Expenditure. £ | $ cts. s. | d. | Cost per ton. s. | $ d. |
|---|---|---|---|---|---|
| Superintendence and handling solutions ... ... ... | | | | | |
| Engine-driving and firing ... | | | | | |
| Discharging presses ... ... | | | | | |
| Dumping residues... ... ... | | | | | |
| Turning zinc ... ... ... | | | | | |
| Assaying and retorting, etc. ... | | | | | |
| Cyanide ... ... ... ... | | | | | |
| Filter-cloth... ... ... ... | | | | | |
| Zinc ... ... ... ... ... | | | | | |
| Fuel ... ... ... ... ... | | | | | |
| Water, salt... ... ... ... | | | | | |
| General stores, charges, repairs, etc. ... ... ... ... | | | | | |
| Compressed air ... ... ... | | | | | |
| Electric light ... ... ... | | | | | |
| Water (condensed) ... ... | | | | | |
| Breaking slimes and sands ... | | | | | |
| Realization charges ... ... | | | | | |

**Table XX.—ORDINARY LIXIVIATION.**—*Quantity treated* .....*tons in* .....

*Percentage of Extraction*= .....

| | | Gross Cost. | | | Per Ton. | | |
|---|---|---|---|---|---|---|---|
| | | $ cts. | £ s. | d. | $ cts. | £ s. | d. |
| Roasting Labour:— | | | | | | | |
| No. of Men. | | | | | | | |
| .....Engines and Boilers ... ... ... | @ .....per shift = | | | | | | |
| .....Rock-breaker, Rolls or Battery ... ... | @ ..... „ = | | | | | | |
| .....Foreman—Roasters ... ... ... | @ ..... „ = | | | | | | |
| .....Helpers ... ... ... ... ... | @ ..... „ = | | | | | | |
| .....Fuel Carriers and Ore Wheelers ... | @ ..... „ = | | | | | | |
| .....Carmen for Raw Ore Charges ... ... | @ ..... „ = | | | | | | |
| Materials:— | | | | | | | |
| % Salt ... lbs. ... ... ... | @ .....per lb. = | | | | | | |
| Cords—Wood (Roasting) or tons Coal... | @ ..... { per cord / „ ton = | | | | | | |
| Do. (Steam Power) do. ... | @ ..... „ = | | | | | | |
| Oil, Light, Tools, etc. ... ... ... ... ... ... ... | ... | | | | | | |
| Repairs ... ... ... ... ... ... ... ... ... | ... | | | | | | |
| Management Office, Assay Office, etc. ... ... ... ... ... | ... | | | | | | |
| Total ... ... ... ... | ... | | | | | | |

## Table XXa.—ORDINARY LIXIVIATION.—*continued.*

| LEACHING:— No. of Men. | GROSS COST. £ | $ cts. | s. | d. | PER TON. £ | $ cts. | s. | d. |
|---|---|---|---|---|---|---|---|---|
| .....Engines and Boilers ... ... ... ... ... ... ... ... | | | | | | | | |
| .....Tramming Ore ... ... ... ... ... ... ... ... ... | | | | | | | | |
| .....Charging and Discharging Vats ... ... ... ... ... .. | | | | | | | | |
| .....Tramming Tailings to Dump ... ... ... ... ... ... ... | | | | | | | | |
| .....Leachers @..... .....per shift ... ... ... ... ... ... | | | | | | | | |
| .....Man preparing Calcium Sulphide ... ... ... ... ... .. | | | | | | | | |
| .....Man roasting Precipitate ... ... ... ... ... ... ... | | | | | | | | |
| Sulphur..... .....lbs. @ ... ... per lb. = ... ... ... ... | | | | | | | | |
| Lime..... .....lbs. @ ... ... ... per lb. = ... ... ... ... | | | | | | | | |
| Fuel for roasting Precipitate ... ... ... ... ... ... ... | | | | | | | | |
| Management Office, Mechanics' Assay Office ... ... ... ... .. | | | | | | | | |
| Oil, Light, Fitters, Tools, etc. ... ... ... ... ... ... ... | | | | | | | | |
| Pumping Charges ... ... ... ... ... ... ... ... ... ... | | | | | | | | |
| *Total, ex* Interest and Depreciation... ... ... ... ... | | | | | | | | |

## Table XXI.—TIME TAKEN IN ORDINARY LEACHING.

| | Hours. | Minutes. |
|---|---|---|
| Charging Vats ... ... ... ... ... ... ... ... ... ... ... ... ... | | |
| Base-metal Leaching ... ... ... ... ... ... ... ... ... ... ... ... | | |
| Expelling the Water with Solution ... ... ... ... ... ... ... ... ... ... | | |
| Silver Leaching ... ... ... ... ... ... ... ... ... ... ... ... ... | | |
| Expelling the Solution with Water ... ... ... ... ... ... ... ... ... ... | | |
| Discharging Vats and Tramming Tailings ... ... ... ... ... ... ... ... ... ... | | |
| | | |
| Total ... ... ... ... ... ... ... ... ... ... ... ... | | |

## Table XXII.—TIME TAKEN IN TROUGH LIXIVIATION.

| | Hours. | Minutes. |
|---|---|---|
| Delivering Ore to "Works" ... ... ... ... ... ... ... ... ... ... ... | | |
| Charging and Base-metal Leaching ... ... ... ... ... ... ... ... ... ... | | |
| Draining Wash Water from top of Ore .. ... ... ... ... ... ... ... ... | | |
| Expelling Base-metal Solution with Water... ... ... ... ... ... — ... ... | | |
| Expelling the Water with Hyphosulphate Solution ... ... ... ... ... ... ... | | |
| Silver Leaching ... ... ... ... ... ... ... ... .. ... .. ... ... | | |
| Draining Solution from top of Ore ... ... ... ... ... ... ... ... ... ... | | |
| *Expelling the Solution* with Water ... ... ... ... ... ... ... ... ... ... | | |
| *Delivering Tailings to Dump* ... ... ... ... ... ... ... ... ... ... ... | | |

## Table XXIII.—WORKING RESULTS OBTAINED IN ROASTING AND ORDINARY LIXIVIATION.

| No. of Furnace. | Year. Month. Day. | Per cent. of Salt used. | Value of raw ore. | Value of raw ore containing salt. | No. of tank charged. | Value of roasted ore. | Value after leaching in laboratory. | Per cent. of chlorination when ore left furnace. | Value of vat tailings. | Per cent. of actual chlorination calculated from vat tailings. | Loss of weight the ore sustained in roasting. | Loss of silver by volatilization. | Loss of silver in tailings. | Per cent. of chlorination gained in the vats. | No. of oz. of silver extracted per ton. | Per cent. of actual silver extraction. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | oz. per ton | oz. per ton | | oz. per ton | oz. per ton | per cent | oz. per ton | per cent | per cent | per cent | per cent | per cent | oz. per ton | per cent | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Averages: | | | | | | | | | | | | | | | | | |

## Table XXIV.—ORDINARY LIXIVIATION (Working Details).

Quantity of water required for base metal leaching and sluicing per ton ... ... ... ... ... ... ... ..... gals.

Quantity of hypo-sulphite sol. which has to circulate for each ton of ore ... ... ... ... ... ... ... ..... gals.

Time required to treat one tank-charge of ore ... ... ... ... ... ... ... ... ..... hrs. ..... mins.

Total quantity of water required per 100 tons of ore per day ... ... ... ... ... ... ... ... ... ..... gals.

Total quantity of hypo sol. required per 100 tons of ore per day ... ... ... ... ... ... ... ... ..... gals.

Total quantity of copper sulphate or other solution required per 100 tons of ore per day ... ... ... ... ..... gals.

Loss of silver in base metal leaching per ton of ore in fractions of an ounce ... ... ... ... ... .....

AVERAGE COMPOSITION OF THE ORE TREATED AS PER SAMPLE FROM CRUSHER:—

| | | | |
|---|---|---|---|
| Carb. of lime ... ... ... ..... | per cent. | Zinc ... ... ... ... ... ..... | per cent. |
| Silica ... ... ... ... ... ..... | „ | Lead ... ... ... ... ... ..... | „ |
| Iron ... ... ... ... ... ..... | „ | Magnesia ... ... ... ... ..... | „ |
| Sulphur ... ... ... ... ..... | „ | Alumina ... ... ... ... ..... | „ |
| Arsenic ... ... ... ... ..... | „ | &c. | |

Average composition of the roasted precipitate ... ... ... ... ... ... ... ... ... ... ... ... .....

**Table XXV.—RUSSEL PROCESS.**—*Quantity treated* ..... *tons in* .....

*Percentage of Extraction.*

| Labour:— | No. of Workmen. | | Working hours. | | | Gross Cost. £ $ s. cts. d. | Cost Per Ton. £ $ s. cts. d. |
|---|---|---|---|---|---|---|---|
| Engines and Boilers | ..... | Engineers | ... ..... | @..... | per shift = | | |
| „ „ | ..... | Foremen ... | ... ..... | @..... | „ = | | |
| Ore house ... ... | ..... | Rock breakers | ... ..... | @..... | „ = | | |
| „ ... ... | ..... | Wheeling ore | ... ..... | @ ... | „ = | | |
| Dry kilns ... ... | ..... | Charging kilns | ... ..... | @..... | „ = | | |
| „ ... ... | ..... | Discharging kilns | ..... | @..... | „ = | | |
| „ ... ... | ..... | Firemen (tending salt kilns and rolls) | ..... | @..... | „ = | | |
| Rolls ... ... | ..... | Machinists | ... ..... | @..... | „ = | | |
| Furnace ... ... | ..... | Firemen ... | ... ..... | @..... | „ = | | |
| Cooling floor ... | ..... | Discharging, cooling, and charging vats | ..... | @..... | „ = | | |
| Lixiviation ... ... | ..... | Lixiviators | ... ..... | @..... | „ = | | |
| „ ... ... | ..... | Helpers ... | ... ..... | @..... | „ = | | |
| Carried forward ... | | | Carried forward ... | | | | |

## Table XXVa.—RUSSEL PROCESS—*continued.*

| LABOUR—*contd.* | No. of Workmen. | | Working hours. | | | Gross Cost. £ | $ | s. | cts. | d. | Cost Per Ton. £ | $ | s. | cts. | d. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brought forward ... | ..... | | Brought forward ... | | | | | | | | | | | | |
| Lixiviation ... ... | ..... | Precipitators ... | .....@..... | per shift | = | | | | | | | | | | |
| ,, .. ... | ..... | Firemen on boilers, pumps, etc. ... ... | .....@..... | ,, | = | | | | | | | | | | |
| ,, ... ... | ..... | Handling sulphides | .....@..... | ,, | = | | | | | | | | | | |
| Refinery ... ... | ..... | Roasters & refiners | .....@..... | ,, | = | | | | | | | | | | |
| Mill ... ... ... | ..... | Night foreman ... | .....@..... | ,, | = | | | | | | | | | | |
| ,, ... ... ... | ..... | Machinist... ... | .....@..... | ,, | = | | | | | | | | | | |
| ,, ... ... ... | ..... | Carpenter ... | .....@..... | ,, | = | | | | | | | | | | |
| ,, ... ... ... | ..... | Blacksmith ... | .....@..... | ,, | = | | | | | | | | | | |
| ,, ... ... ... | ..... | General helpers ... | .....@..... | ,, | = | | | | | | | | | | |
| ,, ... ... ... | ..... | Assayer's assistant | .....@..... | ,, | = | | | | | | | | | | |
| ,, ... ... .. | ..... | Blacksmith's help | .....@..... | ,, | = | | | | | | | | | | |
| ,, ... ... ... | ..... | Electrician ... | .....@..... | ,, | = | | | | | | | | | | |
| ,, ... ... ... | ..... | Book-keeper ... | .....@..... | ,, | = | | | | | | | | | | |
| Carried forward ... | | | Carried forward ... | | | | | | | | | | | | |

## Table XXVb.—RUSSEL PROCESS—*continued.*

| LABOUR—*contd.* | No. of Workmen. | Working hours. | GROSS COST. £ | $ | s. | cts. | d. | COST PER TON. £ | $ | s. | cts. | d. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brought forward ... | ..... | Brought forward ... | ..... | | | | | ..... | | | | |
| Mill ... ... ... | .....Assayer ... ... | .....@.....per shift= | ..... | | | | | ..... | | | | |
| „ ... ... ... | .....Head metallurgist | .....@..... „ = | ..... | | | | | ..... | | | | |
| „ ... ... ... | .....{Men and Team hauling fuel} | .....@..... „ = | ..... | | | | | ..... | | | | |
| Total ... | | ... | ..... | | | | | ..... | | | | |
| FUEL:— | Cords of wood. | Tons of coal. | | | | | | | | | | |
| Engine and boilers ... | .....@.....per cord | @..... ... per ton | ..... | | | | | ..... | | | | |
| Boiler lixiviation house | .....@..... „ | @..... „ | ..... | | | | | ..... | | | | |
| Ore and salt kilns ... | .....@..... „ | @..... „ | ..... | | | | | ..... | | | | |
| Furnace ... ... ... | .....@..... „ | @..... „ | ..... | | | | | ..... | | | | |
| Sulphide refinery .. | .....@..... „ | @..... „ | ..... | | | | | ..... | | | | |
| Totals {Amount ... | | ... | ..... | | | | | ..... | | | | |
| Totals {Value ... | | ... | ..... | | | | | ..... | | | | |

## Table XXVc.—RUSSEL PROCESS.—*continued.*

| | | GROSS COST. | | | | | COST PER TON. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | £ | $ | s. | cts. | d. | £ | $ | s. | cts. | d. |
| CHEMICALS:— | | | | | | | | | | | |
| Copper sulphate ... ... ... ... ..... lb. @ .....per lb. ... | | | | | | | | | | | |
| Sodium hyposulphite ... ... ... ..... „ @ ..... „ ... | | | | | | | | | | | |
| Caustic soda ... ... ... ... ..... „ @ ..... „ ... | | | | | | | | | | | |
| Sulphur ... ... ... ... ... ..... „ @ ..... „ ... | | | | | | | | | | | |
| Sulphuric acid ... ... ... ... ..... „ @ ..... „ ... | | | | | | | | | | | |
| Soda ash ... ... ... ... ... ..... „ @ ..... „ ... | | | | | | | | | | | |
| Lime ... ... ... ... ... ..... „ @ ..... „ ... | | | | | | | | | | | |
| ... | | | | | | | | | | | |
| MATERIALS AND SUPPLIES ... ... ... ... ... ... ... ... | | | | | | | | | | | |
| LIGHT ... ... ... ... ... ... ... ... ... ... ... | | | | | | | | | | | |
| Total cost *ex* interest and depreciation ... ... | | | | | | | | | | | |

**Table XXVI.—GRINDING, MILLING**—*Quantity treated* ..... *tons in* ..... *days* ..... *hrs.*

*No. of Pans employed* ..... *Percentage of Extraction* = ..... ..... ..... ..... . . . . .

| | Gross Cost. | Cost per Pan. |
|---|---|---|
| | £ $ s. cts. d. | £ $ s. cts. d. |
| Wages per Month... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| Fuel ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| Mercury ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| Renewals and Repairs, Castings, Wear of Belts, &c. ... ... ... ... | ..... | ..... |
| Handling "Sludge" ... ... ... ... ... ... ... ... ... | ..... | ..... |
| Oil and Chemicals ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| Ex Redemption and Interest ..... ..... ..... Total cost = ... ... | ..... | ..... |

*Cost per pan* ..... ..... ..... ..... ..... ..... ..... *per day.*

*Capacity of each pan* ..... ..... ..... ..... ..... *(dry weight) of* { *Ore* ..... *or Concentrates* ..... }

*Percentage of pyrites in the concentrates* ..... ..... ..... ..... ..... ..... .....

*Assay of "sludge" after first grinding* ..... ..... ..... ..... ..... ..... *After second grinding* ..... ..... ..... ..... ..... ..... ..... .....

*Interest on a capital outlay* { £ / $ } ..... *at* ..... *% on a total of* ..... ..... ..... *tons treated per annum* = ..... *per ton.*

**Table XXVII.—MODIFIED REES RIVER PROCESS**—*Quantity treated* ..... *tons, in* ..... *days* ..... *hrs.*

*Percentage of Extraction* = .....

| | | Gross Cost. | | | | Per Ton. | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | £ | $ | s. | cts. d. | £ | $ | s. | cts. d. |
| **Labour:—** | | | | | | | | | |
| Supt. and Assayer | @ ..... per shift ... ... ... ... ... | | | | | | | | |
| Mechanic ... ... | „ ..... „ ... ... ... ... ... | | | | | | | | |
| Carpenter ... ... | „ ..... „ ... ... ... ... ... | | | | | | | | |
| Engineers and Stokers | „ ..... „ ... ... ... ... ... | | | | | | | | |
| Rock Brakesmen ... | „ ..... „ ... ... ... ... ... | | | | | | | | |
| Kiln Attendant ... | „ ..... „ ... ... ... ... ... | | | | | | | | |
| Battery Feeders ... | „ ..... „ ... ... ... ... ... | | | | | | | | |
| Pan Men ... ... | „ ..... „ ... ... ... ... ... | | | | | | | | |
| Retorter ... ... | „ ..... „ ... ... ... ... ... | | | | | | | | |
| **Supplies:—** | | | | | | | | | |
| Salt | | | | | | | | | |
| Bluestone ..... | lb. @ ..... ... ... ... ... ... | | | | | | | | |
| Fuel ..... | ton or cords „ ..... ... ... ... ... ... | | | | | | | | |
| Mercury ..... | lb. „ ..... ... ... ... ... ... | | | | | | | | |
| Repairs ..... | ... ... ... ... ... ... ... | | | | | | | | |
| Chemicals and Assay Materials | ... ... ... ... ... ... ... | | | | | | | | |
| Light and Incidentals | ... ... ... ... ... ... ... | | | | | | | | |
| Hauling to Mill | ... ... ... ... ... ... ... | | | | | | | | |
| Total expenses | ... ... ... ... ... ... ... | | | | | | | | |
| Interest and redemption | ... ... ... ... ... ... ... | | | | | | | | |

**Table XXVIII.—WASHOE PROCESS.**—*Quantity treated ... tons, in ... days ... hrs.*

*Percentage of Extraction = ...*

| | Gross Cost. £ $ s. cts. d. | Per Ton. £ $ s. cts. d. |
|---|---|---|
| **Labour.** | | |
| Supt. and Assaying @ .....per shift ... ... ... ... ... | ..... | ..... |
| Crushing ... „ ..... „ ... ... ... ... ... | ..... | ..... |
| Amalgamating „ ..... „ ... ... ... ... ... | ..... | ..... |
| Power, Pumps, etc. „ ..... „ ... ... ... ... ... | ..... | ..... |
| Foremen ... „ ..... „ ... ... ... ... ... | ..... | ..... |
| Tailings Pits „ ..... „ ... ... ... ... ... | ..... | ..... |
| **Supplies.** | ..... | ..... |
| Fuel ... ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| Chemicals and Mercury ... ... ... ... ... ... ... ... | ..... | ..... |
| Lubrication ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| Illumination ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| Castings ... ... ... ... ... ... ... ... ... ... | ..... | ..... |
| Supplies (Assay, etc.) ... ... ... ... ... ... ... ... | ..... | ..... |
| Total ex interest and redemption... ... ... ... ... ... | | |

**Table XXIX.—ROASTING, MILLING.**—*Quantity treated* ..... *tons, in* ..... *days* ..... *hrs.*

*Percentage of Extraction* = .....

| No. of Men. | Occupation. | Gross Cost. | Per Ton. |
|---|---|---|---|
| | | £ $ s. cts. d. | £ $ s. cts. d. |
| | Labour :— | | |
| ..... | Foreman @ ..... per shift ... ... ... | ..... | ..... |
| ..... | Assayer ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Machinists ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Carpenters ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Blacksmiths ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Engine-drivers ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Firemen ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Drying-floor ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Battery men ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Roasters ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Cooling-floor men ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Carmen ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Amalgamators ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Retorter ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Melter ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Labourers ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Watchmen ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Ore-floor men ,, ..... ,, ... ... ... | ..... | ..... |
| ..... | Clerks ,, ..... ,, ... ... ... | ..... | ..... |
| | Total ... ... ... ... | | |

## Table XXIXa.—ROASTING, MILLING.—*Continued.*

| | Gross Cost. | | | | | Per Ton. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Supplies :— | £ | $ | s. | cts. | d. | £ | $ | s. | cts. | d. |
| Salt ... ... .....tons @..... = ... ... ... ... ... | | | | | | | | | | |
| Quicksilver .....lbs. @..... = ... ... ... ... ... | | | | | | | | | | |
| Wood ... .....cords @..... = ... ... ... ... ... | | | | | | | | | | |
| Coal ... .....tons @..... = ... ... ... ... ... | | | | | | | | | | |
| Castings ... ... ... ... ... ... ... ... ... ... | | | | | | | | | | |
| Oil and Waste ... ... ... ... ... ... ... ... ... | | | | | | | | | | |
| Sundries, chemicals, etc. ... ... ... ... ... ... ... | | | | | | | | | | |
| Water ... ... ... ... ... ... ... ... ... ... ... | | | | | | | | | | |
| Haulage ... ... ... ... ... ... ... ... ... ... | | | | | | | | | | |
| Charcoal, assaying and melting ... ... ... ... ... ... ... | | | | | | | | | | |
| Total ex interest and Redemption ... ... ... ... ... ... ... | | | | | | | | | | |

**Table XXX.—SILVER TAILINGS MILL.**—*Quantity treated* ..... *tons in* ..... *days* ..... *hrs.*

*Percentage of Extraction* = .....

| | Gross Cost. | | | | | Cost per Ton. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | £ | $ | s. | cts. | d. | £ | $ | s. | cts. | d. |
| Preparing and Hauling ... ... ... ... ... | | | | | | | | | | |
| Milling:— | | | | | | | | | | |
| Labour ... ... ... ... ... ... ... | | | | | | | | | | |
| Mercury lost ... ... ... ... ... ... ... | | | | | | | | | | |
| Salt ... ... ... ... ... ... ... ... | | | | | | | | | | |
| Sulphate of Copper ... ... ... ... ... ... | | | | | | | | | | |
| Fuel ... ... ... ... ... ... ... ... | | | | | | | | | | |
| Castings ... ... ... ... ... ... ... | | | | | | | | | | |
| General Expenses ... ... ... ... ... ... | | | | | | | | | | |
| Total ... ... ... ... ... ... | | | | | | | | | | |

## Table XXXI.—PATIO PROCESS.

| | Cost Per Ton. £ | $ | s. | cts. | d. |
|---|---|---|---|---|---|
| Breaking, Grinding and Cost of Tools ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Amalgamator's Wages ... ... ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Scraping Tahonas ... ... ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Carrying and Washing Scrapings ... ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Concentrating Tailings of Scrapings ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Carrying Slime from Tahona to Patio... ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Mules and Keep ... ... ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Labour—Spreading Trilla and Mule Driving ... ... ... ... ... ... ... ... ... | | | | | |
| Labour—Washing Trilla ... ... ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Charcoal for Retorting Silver ... ... ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Concentrating Tailings of Trilla ... ... ... ... ... ... ... ... ... ... ... ... ... | | | | | |
| Materials :— | £ | $ | s. | cts. | d. |
| Salt ... ... ... .....lbs. @ ..... ... ... ... | | | | | |
| Copper Sulphate ..... ..... ..... „ ..... ..... ..... ... ... ... | | | | | |
| Precipitated Copper ... ..... „ ..... ... ... ... | | | | | |
| Mercury ... ... ... ..... ..... ..... „ ..... ..... ..... ... ... ... | | | | | |
| Total Cost ... ... ... ... ... ... ... ... ... ... ... | | | | | |

## Table XXXII.—SMELTING.

*Quantity of ore treated* . . . . *tons in* . . . .

*Percentage of Extraction.*

**Labour.**

| Department of Works. | No. of Men. | Occupation. | Per Shift. | Working Hours @ | Gross Cost. | Cost per ton. |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| Materials. | Quantity. | @ | | |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**General Expenses.**

| | | |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |



N

## Table XXXIII.—COMPARATIVE STATEMENT.

**Tabulated results of the treatment** *of..... ....tons of..... . . . . , at the ..... .. .....Works by the .... . .. process.*

| Year. | Tons Crushed. | Assay Value. | Theoretical Extraction, per cent. | Actual Extraction, per cent. | Cost per ton. £ $ s. cts. d. |
|---|---|---|---|---|---|
| January..... | | | | | |
| February ..... | | | | | |
| March ..... | | | | | |
| April ..... | | | | | |
| May ..... | | | | | |
| June ..... | | | | | |
| July ..... | | | | | |
| August ..... | | | | | |
| September..... | | | | | |
| October ..... | | | | | |
| November ..... | | | | | |
| December ..... | | | | | |
| Totals ... | | | | | |

## Table XXXIV.—RESULTS BY DIFFERENT PROCESSES.

| Process. | General Nature of Ore Treated. | Daily Capacity of Works. | Cost of Treatment per Ton. | | Metal or Mineral saved. | Percentage of Saving effected. | |
|---|---|---|---|---|---|---|---|
| | | | Lowest. | Highest. | | Lowest. | Highest. |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

## Table XXXIVa.—MILL AMALGAMATION RESULTS.

| Months. | No. of days worked. | Arrange No. of Mills worked daily. | Amount of Ore reduced. | | Amalgam obtained. | Bar Gold Extracted. | | | Produce of Bar Gold. Per Ton. | | | Standard of Bar Gold in Thousandths. | | Produce of Fine Gold per Ton of ore. | | | | | | Duty. | Mercury. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Wet Ore. | Dry Ore. | | | | | | | | | | Determined by Assay. | | | Extracted by the Mills. | | | | Net Loss Incurred. | Loss per Ton. | |
| | | | Tons. | Tons. | Oz. | Oz. | Dwt | Gr. | Oz. | Dwt | Gr. | Fine Gold. | Fine Silver. | Oz. | Dwt | Gr. | Oz. | Dwt | Gr. | Per Cent. | Oz. | Oz. | Dwt. |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | |
| Totals & Avgs | | | | | | | | | | | | | | | | | | | | | | | |

## Table XXXV.—GENERAL SUMMARY OF RESULTS.

| Year. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Remarks. | Average for the Year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | | Tons. |
| Amount of Ore treated | | | | | | | | | | | | | | |
| Average amount per day | | | | | | | | | | | | | | |
| | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | $ cts. £ s. d. | | $ cts. £ s. d. |
| Cost per ton | | | | | | | | | | | | | | |
| Mining — Development | | | | | | | | | | | | | | |
| Mining — Mining (extraction) | | | | | | | | | | | | | | |
| Mining — *Haulage | | | | | | | | | | | | | | |
| Mining — *Pumping | | | | | | | | | | | | | | |
| Mining — *Compressed air | | | | | | | | | | | | | | |
| Mining — *Tramming | | | | | | | | | | | | | | |
| Transport (surface) | | | | | | | | | | | | | | |
| Reduction — Milling or other treatment | | | | | | | | | | | | | | |
| Management and General Expenses, Insurance, Taxes, Royalties, &c. | | | | | | | | | | | | | | |
| Maintenance and Repairs | | | | | | | | | | | | | | |
| Redemption of Capital — Mine | | | | | | | | | | | | | | |
| Redemption of Capital — Plant | | | | | | | | | | | | | | |
| Current Capital outlay | | | | | | | | | | | | | | |
| Totals | | | | | | | | | | | | | | |

* Note.—These items are frequently distributed between Development and Mining (extraction).

# SUGGESTIONS TO MINE OWNERS AND PURCHASERS.

1. When buying a mining property avoid ventures not open to the fullest investigation in all respects, including titles.

2. See that there are ample reserves of "ore in sight," or, at any rate, sufficient "probable reserves" to justify the purchase price.

3. Consider carefully the past record of the mine, and the district in which it is situated.

4. It is generally best to "bond" (under option of purchase), promising "prospects" sufficiently "opened up" to show they are likely to develop into mines, rather than to buy properties outright when *too fully* developed, which, in other words, are "worked out;" and be careful to avoid staking everything on one property alone.

5. Secure a capable and experienced Directorate, Secretary and Consulting Engineers in London, as well as a "staff" of the highest efficiency obtainable for the work required at the mine. To secure the best results it is always advisable to obtain the assistance of men in control of the business who specialize, and who are consequently thoroughly conversant with all the details of the business.

6. Avoid "overcapitalizing" the property.

7. Provide ample "working capital" to carry out the scheme contemplated and estimated for by the engineer in charge, and let this bear as large a ratio to "nominal" capital as possible; it is highly imprudent to go to allotment unless a sufficient sum is subscribed or otherwise guaranteed to place the undertaking on a sound footing.

8. On technical matters select experienced men, and confide in their judgment for the management and operation of the mine.

9. Look closely into financial details, and make a point of being posted on the general business and development of the mine by insisting on proper monthly and annual returns being regularly rendered in a business-like shape.

10. Before works are erected decide on the process which will yield *most net profit*, and do not stint expense in erecting them properly; but before thinking of doing so, see that you possess a mine which will keep them supplied with ore.

11. If choice can be made between a rich pockety mine and a property with ample reserves of low grade but "pay ore" larger profits will generally result from acquiring a property of the latter kind; looking to quantity rather than "quality" of ore for dividends.

12. "Exploration" and "development" should be kept well ahead of "extraction," and the monthly yields should be averaged as much as possible; so as to avoid phenomenally rich crushings one month, followed by poor or irregular returns the next.

13. Set aside annually a fixed percentage of profits for renewals of machinery and depreciation of plant, and create if possible a real *reserve fund* for the "redemption of capital" and of "ore extracted."

14. Pay *good* salaries and wages for good skilled work; ordinary labour at ordinary rates, and nothing for disloyal, incompetent or neglectful service, and take care that the master-brains of the business, as well as the engines and machinery, are polished periodically, and kept bright!

15. See that strict economy is always studied, but discriminate between true and fictitious economy: Do all the work you can on "contract"; pay bonuses for speed; and premiums for brains.

16. Neither the gross cost of operations, nor payment of high or low wages are any real proofs whatever that either economy or extravagance obtains in the management of any particular mine; the measure of the one or of the other can only be gauged by a comparison from month to month, upon the same basis, of the relative average cost of mining and milling, per ton of ore mined and treated at different mines, under parallel conditions, with approximately the same output. If under such circumstances the costs differ, it is advisable to ascertain where and why they do not correspond; giving due consideration to the fixed and variable factors that must be taken into account in calculations of this kind.

17. Secure if possible a mine in a new and progressing "mining camp" or district with rich and abundant ore, cheap transport, good climate, water power and timber, and where skilled labour and low priced "supplies" are obtainable.

18. If the property is let on "tribute," see that proper provisions are made in the agreement, so that the mine will not be "pig rooted" or otherwise damaged and its value depreciated.

19. The safety of the men and the mine should be your first consideration. Encourage cricket and football clubs, and a reading-room; order, cleanliness, and thrift; and make the homes and lives of the men as comfortable as possible.

20. Finally, extract the payable ore just as quickly as circumstances permit, and leave the balance to posterity.

With preliminary conservative estimates, which are the best guarantee of liberal working-profits, a mine, secured and operated on the above lines, will be found not only a highly remunerative, but a very *safe* investment, not merely a "stock gamble."

In the former case you should hold your shares firm, regardless of market fluctuations. In the latter case, to make money, you should take advantage of every favourable turn of the market to buy or sell.

In any event shares which may be worth buying at £1, may be a bad bargain at £10; but a share at £10 may sometimes be better worth purchasing than one at 10s.

The late Lord Kelvin, in his Presidential address to the British Association in Edinburgh, said:—"Nearly all the grandest discoveries of science had been but the rewards of accurate measurement and patient, long-continued labour in the sifting of numerical results," and it must be admitted that in the pursuit of mining a wide field is open to the engineer, not only in sifting and recording facts, but more particularly in accurately determining their value with a view to apply statistics of this kind to commercial ends. Recollect that individualism and energy, coupled with brains, are the motive forces and fly-wheels of progress; and that *co-operation* between capital and labour, is *essential* to the vitality and well-being of *every* business undertaking; and consequently of the capitalist and the workman alike.

# USEFUL MEMORANDA.

## ENGLISH WEIGHTS AND MEASURES.

12 inches = 1 foot.
3 feet ... = 1 yard.
6 „ ... = 1 fathom.
16½ „ ... = 1 pole.
220 yards... = 1 furlong.

8 furlongs = 1,760 yards = 5,280 feet = 1 mile.
6,086 feet = 1 naut. mile.
7·92 inches = 1 link.
100 links = 66 feet = 22 yds. = 1 chain.

## SQUARE MEASURE.

144 sq. inches = 1 sq. foot.
9 sq. feet = 1 sq. yard.
30¼ sq. yds. / 272¼ sq. feet = 1 sq. rod or pole.
40 sq. rods = 1 rood.
4 sq. roods = 160 sq. rods = 4,840 sq. yds. = 43,560 sq. ft. = 1 acre.
10 sq. chains = 1 acre.

1 hectare = 2·471 acres.
640 acres ... = 1 sq. mile.
30 sq. acres = 1 yd. of land.
Sq. inches × 0·007 = approx. sq. feet.
Sq. yds. × 0·00021 = approx. acres.
113·0977 sq. in. = 1 circular ft.
18·346 circular in. = 1 sq. ft.

## SOLID OR CUBIC MEASURE.

1,728 cubic inches = 1 cub. ft.
27 cubic feet... = 1 cub. yd.
40 cub. ft. of rough / 50 „ „ hewn = 1 ton or load.

128 cubic feet of timber = 1 cord of wood.

Page 145.

## AVOIRDUPOIS WEIGHT.

16 drams ... = 1 oz.
16 ozs. ... = 1 lb.
14 lb. ... = 1 stone.
28 lb. ... = 1 quarter.

112 lb. ... = 1 cwt.
20 cwt. ... = 1 ton.
7,000 grains = 1 lb. avds.
437·5 „ = 1 oz.

## TROY WEIGHT.

24 grains ... = 1 dwt.
20 dwt. ... = 1 oz.
12 oz. ... = 1 lb.

5,760 grains = 1 lb. troy.
480 „ = 1 oz. „

## LIQUID MEASURE.

4 gills = 1 pint = aprx. 34·66 c. inches.
2 pints = 1 quart = „ 69·32 „
4 quarts = 1 gallon = „ 277·27 „

## FRENCH WEIGHTS AND MEASURES.

### WEIGHTS.

1 gramme ... ... ... ... = 15·432 grains troy.
1 decagramme = 10 grammes = 5·644 drams av.
1 hectogramme = 100 „ = 3·527 oz. av.
1 kilogramme = 1,000 „ = 2·204 lb. av.
= 2·679 lb. troy.
1 quintal ... = 100 kilos = 220·462 lb. av.
1 tonne ... = 1,000 „ = 2,204·621 lb. av.
1 decigramme = 1/10 gramme = 1·5432 grains.
1 centigramme = 1/100 „ = 0·15432 „
1 milligrame = 1/1000 „ = 0·015432 „

## LINEAL MEASURES.

| | | | |
|---|---|---|---|
| 1 metre ... | ... = | | 39·37 inches. |
| 1 decametre | ... = | 10 metres = | 32·808 feet. |
| 1 hectometre | ... = | 100 „ = | 328·089 feet. |
| 1 kilometre... | ... = | 1,000 „ = | 1,093·633 yards. |
| 1 myriametre | ... = | 10,000 „ = | 6·2138 miles. |
| 1 decimetre | ... = | 1/10 „ = | 3·9370 inches. |
| 1 centimetre | ... = | 1/100 „ = | 0·3937 „ |
| 1 millimetre | ... = | 1/1,000 „ = | 0·0393 „ |

## SUPERFICIAL MEASURES.

| | | |
|---|---|---|
| 1 centiare | ... = | 1 sq. metre = 1·19603 sq. yards. |
| 1 are ... | ... = | 100 sq. metres = ·098845 rood. |
| 1 hectare | ... = | 10,000 sq. „ = 2·471143 acres. |

## MEASURES OF CAPACITY.

1 litre = 1 cub. decimetre = 1·7607 pint = 61·027 cub. inches.

| | | | |
|---|---|---|---|
| 1 decalitre ... | ... = | 10 litres = | 2·2009 gal. |
| 1 hectolitre | ... = | 100 „ = | 22·009 „ |
| 1 kilolitre ... | ... = | 1,000 „ = | 220·096 „ |
| 1 decilitre ... | ... = | 1/10 „ = | ·17598 pint. |
| 1 centilitre... | ... = | 1/100 „ = | ·01759 „ |

## LAND MEASURE.

1 Stere ... ... = 1 cub. metre = 1·308 cubic yard.
1 decastere = 10 steres = 13·079 cubic yards.
1 decistere = 1/10 „ = 3 cubic feet, 918·4 cubic inches.



## MONEY (approx. values).

20/- = £1 ; 1/- = 24·33 cts. = 0·05£ = 12d. = 1·022 marks (German), 1·261 frs. (French).

$1·00 U.S. (gold) = 4·109 shillings ; 1 penny = 2·03 cents = 10·51 centimes (French) = 8·52 pfennigs (German).
1 cent (U.S.A.) = 0·493 penny.

| | U.S. gold dollar. |
|---|---|
| Argentine, 1 peso = 100 centavos ... ... ... = | 0·965 |
| Austria Hungary, 1 krone = about 1·05 frs. ... = | 0·203 |
| Belgium, 1 franc = 100 centimes ... ... ... = | 0·193 |
| Bolivia, 1 boliviano = 100 centavos... ... ... = | 0·352 |
| Brazil, 1 milreis = 1,000 rais ... ... ... = | 0·546 |
| Canada, 1 dollar ... ... ... ... ... = | 1·00 |
| Chili, 1 peso = 10 dineros ... ... ... ... = | 0·365 |
| China, 1 tael, average ... ... ... ... = | 0·519 |
| Cuba, 1 peso ... ... ... ... ... ... = | 0·926 |
| Denmark, 1 krone = 100 öre ... ... ... ... = | 0·268 |
| Ecuador, 1 sucre ... ... ... ... ... = | 0·487 |
| Egypt, £1 = 100 piastres = 4,000 paras ... ... = | 4·943 |
| Finland, 1 markka = 100 penni ... ... ... = | 0·193 |
| France, 1 franc = 100 centimes ... ... ... = | 0·193 |
| Germany, 1 mark = 100 pfennig ... ... ... = | 0·238 |
| Great Britain, £1 stg. = 20/- ... ... ... = | 4·866 |
| Greece, 1 drachma = 100 lepta ... ... ... = | 0·193 |
| Haiti, 1 gourde = 100 cents.... ... ... ... = | 0·965 |
| Honduras, 1 peso ... ... ... ... ... = | 0·352 |
| India, 1 rupee = 16 annas ... ... ... ... = | 0·324 |
| Italy, 1 lira = 100 centisime ... ... ... ... = | 0·193 |
| Japan, 1 yen = 100 sen ... ... ... ... = | 0·498 |
| Mexico, 1 dollar (silver) = 1 peso = 100 centavos... = | 0·383 |
| „ 1 dollar (gold) ... ... ... ... = | 0·983 |

## Money (approx. value)—*continued.*

| | | | | |
|---|---|---|---|---|
| Netherlands, 1 florin = 100 cents | ... | ... | ... | = $0·402 |
| Newfoundland, 1 dollar | ... | ... | ... | = 1·014 |
| Nicaragua (silver), 1 peso | ... | ... | ... | = 0·352 |
| Norway, 1 krone = 100 öre | ... | ... | ... | = 0·268 |
| Persia (silver), 1 kran | ... | ... | ... | = 0·065 |
| „ (gold), 1 tomans | ... | ... | ... | = 1·704 |
| Peru, 1 sol = 10 dineros = 100 centavos | | | ... | = 0·487 |
| Portugal, 1 milreis = 10 testoons = 1,000 reis | | | ... | = 1·080 |
| 1 crown = 10 milreis. | | | | |
| Russia, 1 rouble = 2 poltinniks = 10 griviniks = 100 kopecks | ... | ... | ... | = 0·515 |
| Salvador (silver), 1 peso | ... | ... | ... | = 0·352 |
| Singapore, 1 dollar = 2s. 4d. | ... | ... | ... | = 0·568 |
| Spain, 1 peseta = 100 centimes | ... | ... | ... | = 0·193 |
| Sweden, 1 krone = 100 öre | ... | ... | ... | = 0·268 |
| Switzerland, 1 franc = 100 centimes | | | ... | = 0·193 |
| Turkey, 1 piastre = 40 paras | ... | ... | ... | = 0·044 |
| Uruguay, 1 peso = 100 centavos | ... | ... | ... | = 1·034 |
| United States, 1 dollar = 10 dimes = 100 cents. | | | | |
| 20 dollars = 1 eagle. | | | | |
| Venezuela, 1 bolivar = 2 decimos | ... | ... | ... | = 0·193 |

Subject to fluctuations in exchange in some cases.

## † MEXICAN MINING WEIGHTS.

| | | |
|---|---|---|
| 1 grano | = | ·7716 gr. |
| 12 „ | = 1 tomin | = 9·2592 „ |
| 6 tomines | = 1 ochava | = ·12635 oz. |
| 8 ochavas | = 1 onza | = 1·0148 „ |
| 8 onzas | = 1 marco | = 8·1184 „ |

The marco is employed for weighing bullion.

Ore is valued as so many marcos of silver per "carga."

The "carga" = 12 arrobas = 304·332 lb.

To reduce onzas per carga to oz. per ton, multiply by 6·078; and to convert ozs. per ton to onzas per carga, multiply by ·165.

| | | | |
|---|---|---|---|
| Tho "monton" in | Zacatecas | = 20 quintals | = 2,000 lb. |
| „ „ | Guanajuato | | = 3,200 „ |
| „ „ | some places | | = 3,000 „ |
| „ „ | others | = 4 cargas | = 1,200 „ |

Page 147.

## GENERAL MEASURES.

### (Conversion Factors).

| | | |
|---|---|---|
| Circle diameter | × | 3·1416 = circumference. |
| „ „ | × | ·8862 = side of an equal square. |
| „ „ | × | ·7071 = side of an inscribed square. |
| „ area = diameter$^2$ | × | ·7854. |
| „ circumference | × | ·31831 = diameter. |
| Circular inches | | 183·346 = 1 sq. foot. |
| Sphere diameter$^3$ | × | ·5236 = solidity. |
| „ „ | × | ·806 = dimensions of equal cube. |
| „ „ | × | ·6667 = length of equal cylinder. |
| Cylindrical inches | × | ·0004545 = cubic foot. |
| „ „ | × | ·002831 = gallon. |
| „ „ | | 2,200 = 1 cubic foot. |
| „ feet | × | ·02909 = cubic yard. |
| Square side | × | 1·128 = diameter of an equal circle. |
| „ root of area | × | 1·12837 = „ „ |
| „ inches | × | ·00695 = sq. ft. |

† Given by C. G. Warnford Lock (The Miner's Pocket Book).

## General Measures—*continued.*

| | | | |
|---|---|---|---|
| Square feet | ... | ... | × ·0000229 = acres. |
| „ yards | ... | ... | × ·0002066 = acres. |
| Cubic inches | ... | ... | × ·00058 = cubic ft. |
| „ feet | ... | ... | × ·03704 = cubic yd. |
| „ „ | ... | ... | × ·6232 = gallon. |
| Lineal feet | ... | ... | × 1·51515 = links. |
| „ „ | ... | ... | × ·00019 = miles. |
| „ yards | . . | ... | × 4·54545 = links. |
| „ „ | ... | ... | × ·000568 = miles. |
| „ links | ... | ... | × ·66 = feet. |
| „ „ | ... | ... | × ·22 = yards. |
| „ chains | | ... | × ·0125 = miles. |
| „ miles | ... | ... | × 5,280 = feet. |
| „ „ | ... | ... | × 1,760 = yards. |
| „ „ | ... | ... | × 80 = chains. |
| Acres | ... | ... | × 43,560 = sq. feet. |
| „ | ... | ... | × 4,840 = sq. yards. |

Area of circle = diameter$^2$ × ·7854.
Parallelogram = base × height.
Trapezium :—Divide into 2 triangles and find area of each.
Trapezoid = height × ½ the sum of the parallel sides.
Triangle = base by ½ height.

## SURVEYING.

Latitude (N. or S.) = cos. of angle of bearing × distance.
Departure (E. or W.) = sine of „ „ × „
Level difference of = sin of angle of inclination × hypothenuse
Horizontal measurement = cos. of angle of inclination × „
Inclination, rate of (ratio of base to perp.) = cot. of angle.
Slope, rate of (ratio of hyp. to perp.) = cosec. of angle.

Page 148.

To ascertain the acreage of any plot of ground, divide the number of sq. links by 100,000.

To find the area of any triangular piece of ground, multiply the base by the perpendicular and divide the result by two.

To set out a right angle with a tape, measure 40 feet or yards along the survey line and put in pegs at each end. Then with the end of the tape fixed at one end A, take 80 feet along the tape and hold it at the other end of the line at B. Take the 50 feet mark and pull from A and B until it is taut, and you will get a point C, perpendicular to the line A—B.

## WATER POWER.—Also see "Instructions" p. 12.

Calculate the average depth and breadth of the stream, and multiply the area obtained in square feet by the mean observed velocity of floats in feet per second,† which will give the volume discharged.

To calculate the H.P. multiply the cubic feet discharged per minute by the fall obtainable, and multiply this by 62·3 lb. (the weight of 1 cubic foot of water) and divide by 33,000.

This gives the theoretical horse power from which deductions must be made for various kinds of motors, pelton-wheels, turbines, and overshot or undershot water wheels.

† These observations should not be made in seasons of "flood."

## HYDRAULICS.

An imperial gallon of water at 62° F. weighs 10 lb. avd.
Gallons × ·1606 = cubic feet. Cubic feet × 6·228 = gals.
Gallons × 277·46 = cubic inches.
Cubic inches × 0·003604 = gallons.
Cubic feet of water × 62·28 = pounds.
Pounds of water × 0·0160 = cubic feet.
Gallons of water × 0·004464 = tons.
Cubic feet of water × 0·0278 = tons.
A pipe 3 feet long holds about as many lbs. of water as the square of its diameter in inches; actually 1·52 per cent. less. 10 ft. head of water gives a pressure of 4⅓ lb. per square inch approximately.
If H = head of water in feet, P = lb. pressure per sq. inch. H = P × 2·311. P = H × ·4326.
One H.P. indicated will raise about 3,000 gallons of water per hour 50 feet.
To pump 1 gallon of water per minute against a pressure of 4 lbs. per sq. inch requires P × ·0007 H.P.
1 cubic foot of fresh water at 40° weighs 62·425 lb.
1 „ „ salt „ „ „ 64 lb.

## RAINFALL.

1 inch of rain = 22,680 gallons or 102·35 tons of water per acre.

## TIMBER (dry).

Page 149.

| | Sp. gr. | Approx. weight per cubic foot in lbs. |
|---|---|---|
| Ash and Teak ... ... | ·832 | 52 00 |
| Birch ... ... ... ... | ·720 | 45·00 |
| Cowrie pine (Australia) ... | ·579 | 36·20 |
| Fir (Norway spruce) ... | ·512 | 32·00 |
| Fir (Scotch pine) ... ... | ·429 | 26·81 |
| Pine (Memel and Riga) ... | ·466—·553 | 29·12—34·56 |
| Oak ... ... ... ... | ·625—·879 | 39·06—54·97 |
| Iron bark (Australia) ... | 1·032 | 64·50 |
| Stringy bark (Australia) ... | ·864 | 54·00 |

## THERMOMETER SCALES.

To change Fahrenheit to Centigrade, take the F. reading 32° lower than the actual reading, and multiply by 5 and divide by 9.

To change Centigrade to Fahrenheit the process must be reversed, adding instead of substracting 32°.

To change Centigrade to Réaumur × 4 ÷ 5.

To change Réaumur to Centigrade × 5 ÷ 4.

To change Fahrenheit to Réaumur, subtract 32°, then multiply by 4 and divide by 9.

To change Réaumur to Fahrenheit, add 32°, then multiply by 4 and divide by 9.

## ANEROID MEASUREMENT.

For hills under 2,000 feet in height the following rule gives a close approximation.

Observe the altitudes at top and bottom and the temperature Fahrenheit with good instruments. Let B represent the mean altitude and C the mean temperature. Then $55{,}000 \times \frac{B-C}{B+C}$ = height of hill in feet for a temperature of 55° F. Add $\frac{1}{100}$ of this result for every degree the mean temperature is in excess of 55°, or deduct the same amount for every degree below 55°.

# STANDARDS AND DEFINITIONS.

THE INSTITUTION OF MINING AND METALLURGY.

*(Excerpt from Bulletin No. 38).*

## "ORE IN SIGHT."

THE COUNCIL of the INSTITUTION OF MINING AND METALLURGY, recognising the great importance, to the Mining Industry and to the public generally, of the subject dealt with in the paper on "Ore in Sight," by Mr. J. D. KENDALL (*Transactions*, Volume X.), appointed a Committee to consider what steps the Institution might usefully take in defining the term "Ore in Sight."

The views expressed by leading Members of the Profession showed a great divergence of opinion as to the definition of the term.

After due consideration and discussion the Council came to the following decision:—

1. That members of the Institution should not make use of the term **"Ore in Sight,"** in their Reports, without indicating, in the most explicit manner, the data upon which the estimate is based; and that it is most desirable that estimates should be illustrated by drawings.

PAGE 150.

2. That as the term **"Ore in Sight"** is frequently used to indicate two separate factors in an estimate, namely:—

(*a*) **Ore Blocked Out**—that is Ore exposed on at least three sides within reasonable distance of each other—and

(*b*) **Ore which may be reasonably assumed to exist** though not actually "blocked out,"

these two factors should in all cases be kept distinct, as (*a*) is governed by fixed rules, whilst (*b*) is dependent upon individual judgment and local experience.

3. That in making use of the term "Ore in Sight" an Engineer should demonstrate that the Ore so denominated is capable of being profitably extracted under the working conditions obtaining in the district.

4. That the members of the Institution be urged to protect the best interests of the Profession by using their influence in every way possible to prevent and discourage the use of the term "Ore in Sight" except as defined above; and the Council also strongly advise that no ambiguity or mystery in this connection should be tolerated, as they (the Council) consider that such ambiguity is an indication of dishonesty or incompetence.

By Order of the Council,

C. McDERMID,
*Secretary.*

SALISBURY HOUSE, LONDON, E.C.,
*September 30th*, 1902.

# STANDARDS AND DEFINITIONS.

THE INSTITUTION OF MINING AND METALLURGY.

*(Excerpt from Bulletin No 38.)*

## MESH OR WIRE CLOTH.

The following table of "I. M. M. Standard Laboratory Screens" is intended for use in making grading tests and for the correlation of screens used in commercial or other work.

When screens other than the I. M. M. Standards are employed, the diameters of apertures should be given in any published results, so that comparisons may be made.

When screens are described simply by the number of meshes per linear inch, it will be understood that the I. M. M. Standard is referred to.

The number of sizes standardised has been reduced to a minimum, as it is desirable to abandon excessive refinements in grading tests. It is believed that the I. M. M. Standards will meet all necessary requirements of the Laboratory.

In reporting grading tests, it is desirable to state whether wet or dry screening has been employed.



### I. M. M. Standard Laboratory Screens.

| MESH or apertures per linear inch. | Diameter of WIRE. | | APERTURE. | | Screening Area. |
|---|---|---|---|---|---|
| | In. | mm. | In | mm. | Per cent. |
| 5 | 0·1 | *2·540* | 0·1 | *2·540* | 25·00 |
| 8 | 0·063 | *1·600* | 0·062 | *1·574* | 24·60 |
| 10 | 0·05 | *1·270* | 0·05 | *1·270* | 25 00 |
| 12 | 0·0417 | *1·059* | 0·0416 | *1·056* | 24·92 |
| 16 | 0·0313 | *0 795* | 0·0312 | *0·792* | 24·92 |
| 20 | 0 025 | *0·635* | 0·025 | *0·635* | 25·00 |
| 30 | 0·0167 | *0·424* | 0·0166 | *0·421* | 24·80 |
| 40 | 0 0125 | *0·317* | 0 0125 | *0·317* | 25 00 |
| 50 | 0 01 | *0·254* | 0·01 | *0·254* | 25·00 |
| 60 | 0·0083 | *0 211* | 0·0083 | *0·211* | 24·80 |
| 70 | 0·0071 | *0·180* | 0·0071 | *0·180* | 24·70 |
| 80 | 0·0063 | *0·160* | 0·0062 | *0·157* | 24·60 |
| 90 | 0·0055 | *0·139* | 0 0055 | *0·139* | 24·50 |
| 100 | 0·005 | *0·127* | 0·005 | *0·127* | 25·00 |
| 120 | 0·0041 | *0·104* | 0·0042 | *0·107* | 25·40 |
| 150 | 0·0033 | *0·084* | 0·0033 | *0·084* | 24·50 |
| 200 | 0·0025 | *0·063* | 0·0025 | *0·063* | 25·00 |

NOTE.—While *absolute* accuracy to the fourth place of decimals of an inch is impracticable in the manufacture of Wire Cloth, a sufficiently close approximation to the above standards is attainable.

The adoption of a screening area of 25 per cent., necessitating equality of size of wire and aperture, secures perfect interlocking and consequent permanence of aperture.

Some of the finer mesh screens can only be woven in what is known as "twilled."

## WEIGHTS AND MEASURES.

**The following Definitions have been adopted by the Institution:—**

(1) The word "ton" shall represents a weight of 2,000 lb. avoirdupois (29,166.6 oz. troy).

NOTE.—It is advisable to abandon the use of the terms hundredweights and quarters, and to express fractions of a ton in pounds or in decimals of a ton.

(2) The term "miners' inch" shall represent a flow of 1·5 cub. ft. of water per minute; and the term "sluice head" shall represent a flow of 60 cub. ft. of water per minute.

NOTE.—It is advisable to abandon the use of both terms, as being merely of local usage, in favour of definite expression of the flow of water per minute, or per second, in cub. ft. or in gallons.

(3) The word "gallon" shall represent the Imperial gallon measure of 10 lb. of water.

(4) Temperatures shall be expressed in degrees centigrade.

(5) Returns of gold and silver shall be expressed in terms of fine gold and fine silver respectively, not as "bullion."



(6) Gold contents of ores, &c., determined by assay, shall be expressed in money values as well as in weights; and in this connection the value shall be taken (as a convenient constant) at 85 shillings, or $20.67 U.S. Currency, per troy ounce of fine gold.

By Order of the Council,

C. McDERMID,
*Secretary.*

SALISBURY HOUSE,
LONDON, E.C.,
*November 4th*, 1907.

**SPECIFICATIONS OF STANDARD BOILERS** (Excerpt from MacDonald's "Skeleton Mining Report," with the Author's kind permission). Type of boiler, plain cylindrical-shell, with tubes the full length of the boiler, and externally fired.

| NUMBER OF SIZE ... ... ... | 1 | 2 | 3 | 3½ | 4 | 5 | 6 | 7 | 7½ | 8 | 9 | 10 | 10½ | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HORSE POWER usually rated ... | 10 | 12 | 15 | 20 | 20 | 25 | 30 | 35 | 40 | 40 | 45 | 50 | 60 | 60 | 70 | 80 | 90 | 100 | 125 | 150 |
| DIAMETER OF BOILER in inches | 30 | 30 | 36 | 36 | 42 | 42 | 44 | 44 | 44 | 48 | 48 | 54 | 54 | 60 | 60 | 60 | 66 | 66 | 72 | 72 |
| Length of Tubes used in feet... ... | 7 | 8 | 8 | 10 | 8 | 10 | 10 | 12 | 14 | 12 | 14 | 12 | 15 | 12 | 14 | 16 | 15 | 16 | 16 | 18 |
| No. of Tubes, 3 in. ... ... ... | 20 | 20 | 28 | 28 | 38 | 38 | 46 | 46 | 46 | 52 | 52 | 64 | 64 | 82 | 82 | 82 | 98 | 98 | 120 | 84 |
| Sq. ft. Heating Surface, about ... | 131 | 185 | 220 | 288 | 305 | 376 | 440 | 526 | 611 | 591 | 667 | 708 | 880 | 885 | 1028 | 1172 | 1296 | 1377 | 1660 | 4" Tbs |
| Length Grates ,, inches | 36 | 36 | 36 | 42 | 36 | 42 | 42 | 48 | 54 | 48 | 54 | 48 | 54 | 48 | 54 | 54 | 54 | 54 | 54 | 60 |
| Diameter of Dome ,, ,, ... | 18 | 18 | 20 | 20 | 22 | 22 | 22 | 22 | 22 | 26 | 26 | 30 | 30 | 32 | 32 | 32 | 36 | 36 | 36 | 36 |
| Height of Dome ,, ,, ... | 20 | 20 | 22 | 22 | 24 | 24 | 24 | 24 | 24 | 28 | 28 | 34 | 34 | 36 | 36 | 36 | 40 | 40 | 40 | 40 |
| Thickness of Shell ,, ,, ... | ¼ | ¼ | ¼ | ¼ | 9/32 | 9/32 | 9/32 | 9/32 | 9/32 | 5/16 | 5/16 | 5/16 | 5/16 | 11/32 | 11/32 | 11/32 | 3/8 | 3/8 | 7/16 | 7/16 |
| ,, Main Heads ,, ,, ... | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 7/16 | 7/16 | 7/16 | 7/16 | 7/16 | 7/16 | 7/16 | 7/16 | 7/16 | ½ | ½ |
| Diameter of Smoke Stack ,, ,, ... | 14 | 14 | 16 | 16 | 20 | 20 | 22 | 22 | 22 | 24 | 24 | 26 | 26 | 28 | 28 | 28 | 30 | 30 | 34 | 36 |
| Length of Smoke Stack ,, ,, ... | 28 | 28 | 28 | 35 | 28 | 35 | 35 | 40 | 50 | 40 | 50 | 40 | 50 | 40 | 50 | 60 | 60 | 60 | 60 | 60 |
| Weight of Boiler, about ... feet ... | 1900 | 2300 | 2600 | 2900 | 3500 | 4000 | 4300 | 4900 | 5500 | 6000 | 6800 | 7000 | 8200 | 9000 | 9900 | 11000 | 12700 | 13000 | 16000 | 17300 |
| Weight of Fixtures, about ... ... | 3400 | 3900 | 4300 | 4850 | 5700 | 6500 | 6900 | 7600 | 8500 | 9400 | 10300 | 10800 | 12000 | 13000 | 14400 | 16000 | 17700 | 18000 | 22000 | 23500 |
| With Full Front, about ... ... ... | 4400 | 4900 | 5300 | 5800 | 7000 | 7700 | 8400 | 9000 | 10000 | 10200 | 11500 | 12000 | 13500 | 14500 | 16000 | 17000 | 19000 | 20000 | 24000 | 25000 |

## EVAPORATIVE POWER OF DOUBLE AND SINGLE FLUED STEAM BOILERS.

Table kindly furnished to the Author by A. J. Capron, Esq., Messrs. Davy Bros., Ltd.

| Diameter of Boiler. | Length of Boiler. | No. of Flues. | Diameter of Flues. | Grate Area. | Heating Surface. | Lbs. of water evaporated per hour, from and at 212° Far., natural draught. | Lbs. of water evaporated per hour, from and at 212° Far., when fitted with Ellis & Eaves' system of induced draught. |
|---|---|---|---|---|---|---|---|
| ft. in. | ft. in. | | | sq. ft. | sq. ft. | | |
| 9 0 | 30 0 | 2 | 3 8 | 43 | 1,050 | 9,000 | 12,000 |
| 9 0 | 28 0 | 2 | 3 8 | 43 | 1,000 | 8,500 | 11,500 |
| 8 6 | 30 0 | 2 | 3 5 | 40 | 1,000 | 8,000 | 11,000 |
| 8 6 | 28 0 | 2 | 3 5 | 40 | 910 | 7,700 | 10,500 |
| 8 0 | 30 0 | 2 | 3 2 | 38 | 950 | 7,500 | 10,000 |
| 8 0 | 28 0 | 2 | 3 2 | 38 | 880 | 7,000 | 9,500 |
| 7 6 | 30 0 | 2 | 3 0 | 36 | 845 | 5,800 | 9,500 |
| 7 0 | 30 0 | 2 | 2 9 | 33 | 780 | 5,200 | 8,900 |
| 6 6 | 30 0 | 2 | 2 6 | 25 | 650 | 4,000 | 6,500 |
| 6 6 | 28 0 | 2 | 2 6 | 25 | 610 | 3,800 | 6,000 |
| 6 0 | 28 0 | 1 | 3 0 | 15 | 480 | 3,000 | 4,200 |
| 6 0 | 20 0 | 1 | 3 0 | 15 | 365 | 2,500 | 3,200 |
| 5 6 | 26 0 | 1 | 2 9 | 13½ | 390 | 2,300 | 3,000 |
| 5 6 | 20 0 | 1 | 2 9 | 13½ | 310 | 1,900 | 2,500 |
| 5 0 | 24 0 | 1 | 2 6 | 12½ | 320 | 2,000 | 2,600 |
| 5 0 | 20 0 | 1 | 2 6 | 12½ | 265 | 1,650 | 2,200 |

**VALUATION OF MINING SHARES OF PRODUCING COMPANIES.**—It is difficult to value a mining share even approximately in countries where reefs can be followed beyond vertical boundary lines, and the ultimate "life" cannot be estimated; in such cases the present value of the net profits "in sight," plus an allowance for probable and possible profits, divided by the number of issued shares, is the best one can do. In the Transvaal, however, lives of mines can generally be estimated to within two or three years; also averages of dip of reef, sorting, extraction, probable working costs, profits, allowance for capital expenditure, and dividends can all be estimated fairly closely.

Supposing, in a Company with an Issued Capital of 300,000 Shares of £1 each, the future average dividend is estimated to be 20% or £60,000 for say 10 years, and 6% interest is required as well as a certain sum per annum which, accumulated at say 3% compound interest, will redeem the purchase price in 10 years, then

$$\frac{£60{,}000 \times 6{\cdot}79205}{300{,}000} = \frac{£407{,}523}{300{,}000} = £1 \quad 7s. \quad 2d. \quad \text{per share.}$$

To this, however, must be added any cash or other realizable assets there may be, and the "present value" of the price that the freehold property, machinery, plant, &c., may fetch at the end of the mine's life.

The above rates of interest (6% and 3%) are only given as illustrations to suit individual tastes; the most usual rates are "5% and 5%," "6% and 3%," "7% and 4%," and "8% and 4%." Factors for these and other rates can be obtained from Books of Interest tables† or worked out, but great care is necessary in using factors owing to the combination of two different rates of interest. Further useful information dealing with this subject, with actuarial tables, is given in "Mines of the Transvaal," by R. R. Mabson ("Statist"). This matter was recently discussed in an Article in the Financial Times.

† Such as Schooling's Mathematical Tables, and Hoskold's "Engineer's Valuing Assistant."

# TONS PER CLAIM.

According to Mr. Hellmann's† calculations, based on the average of Rand ores, about 12 cubic feet may be taken to the ton. This measurement means that 1 ft. of reef at various degrees of dip would yield the number of tons per claim mentioned in the following table:—

| Dip Degrees. | Tons per Claim 1 foot of Ore. | Dip Degrees. | Tons per Claim 1 foot of Ore. |
|---|---|---|---|
| Flat | 5,335 | 50° | 8,300 |
| 5° | 5,356 | 55° | 9,302 |
| 10° | 5,418 | 60° | 10,671 |
| 15° | 5,524 | 65° | 12,625 |
| 20° | 5,678 | 70° | 15,600 |
| 25° | 5,887 | 75° | 20,615 |
| 30° | 6,160 | 80° | 30,725 |
| 35° | 6,513 | 85° | 61,217 |
| 40° | 6,965 | 90° | 64,562 |
| 45° | 7,546 | | |

Each claim is 150 Cape feet along the reef—*i.e.*, on the strike—and the claim is 400 Cape feet across the line of the reef.

With a "flat" reef 1 foot thick, each acre would yield (12 cubic feet = 1 ton) about 3,550 tons.

† Trans. Inst. Mining and Metallurgy Vol. VI.

# DIP CHART,

Showing at what Vertical Depth the Reef should be struck from a distance of 1,000 to 14,000 Cape feet from outcrop.

| Dip of Reef, Degrees. | Distance (in Cape feet) from Outcrop of Reef. | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 | 8,000 | 9,000 | 10,000 | 11,000 | 12,000 | 13,000 | 14,000 |
| 10° ... | 176 | 352 | 528 | 704 | 880 | 1,056 | 1,232 | 1,408 | 1,584 | 1,760 | 1,936 | 2,112 | 2,288 | 2,464 |
| 15° ... | 268 | 536 | 804 | 1,072 | 1,340 | 1,608 | 1,876 | 2,144 | 2,412 | 2,680 | 2,948 | 3,216 | 3,484 | 3,752 |
| 20° ... | 364 | 728 | 1,092 | 1,456 | 1,820 | 2,184 | 2,548 | 2,912 | 3,276 | 3,640 | 4,004 | 4,368 | 4,732 | 5,096 |
| 25° ... | 466 | 932 | 1,398 | 1,864 | 2,330 | 2,796 | 3,262 | 3,728 | 4,194 | 4,660 | 5,126 | 5,592 | 6,058 | 6,524 |
| 30° ... | 577 | 1,154 | 1,731 | 2,308 | 2,885 | 3,462 | 4,039 | 4,616 | 5,193 | 5,770 | 6,347 | 6,924 | | |
| 35° ... | 700 | 1,400 | 2,100 | 2,800 | 3,500 | 4,200 | 4,900 | 5,600 | 6,300 | 7,000 | | | | |
| 40° ... | 839 | 1,678 | 2,517 | 3,356 | 4,195 | 5,034 | 5,873 | 6,712 | | | | | | |
| 45° ... | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 | | | | | | | |
| 50° ... | 1,192 | 2,384 | 3,576 | 4,768 | 5,960 | 7,152 | | | | | | | | |
| 55° ... | 1,428 | 2,856 | 4,284 | 5,712 | 7,140 | | | | | | | | | |
| 60° ... | 1,732 | 3,464 | 5,916 | 6,928 | | | | | | | | | | |
| 65° ... | 2,144 | 4,288 | 6,432 | | | | | | | | | | | |
| 70° ... | 2,747 | 5,494 | | | | | | | | | | | | |
| 75° ... | 3,732 | 7,464 | | | | | | | | | | | | |
| 80° ... | 5,684 | | | | | | | | | | | | | |

1 Cape Foot = 1·033 English Feet.

# HORSE POWER FOR HOISTING.†

The Table gives the horse power required for hoisting various loads at the speed shown. An allowance of 20 per cent. has been made for friction.

| Weight of Ore, Car, Cage and Rope. | Speed—Feet per Minute. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |
| 1,000 | $\frac{7}{8}$ | $1\frac{7}{8}$ | $3\frac{3}{4}$ | $5\frac{1}{2}$ | $7\frac{1}{2}$ | 9 | 11 | 13 | $14\frac{1}{2}$ | $16\frac{1}{4}$ | 18 |
| 1,200 | 1 | $2\frac{1}{4}$ | $4\frac{1}{4}$ | $6\frac{1}{2}$ | $8\frac{3}{4}$ | 11 | 13 | 15 | $17\frac{1}{2}$ | $19\frac{1}{2}$ | 22 |
| 1,500 | $1\frac{1}{2}$ | $2\frac{3}{4}$ | $5\frac{1}{2}$ | $8\frac{1}{4}$ | 11 | 14 | $16\frac{1}{2}$ | 17 | 22 | $24\frac{1}{2}$ | $27\frac{1}{4}$ |
| 1,800 | $1\frac{3}{4}$ | $3\frac{1}{4}$ | $6\frac{1}{2}$ | $9\frac{3}{4}$ | 13 | $16\frac{1}{4}$ | $19\frac{1}{2}$ | $22\frac{3}{4}$ | 26 | $29\frac{1}{4}$ | $32\frac{1}{2}$ |
| 2,000 | $1\frac{7}{8}$ | $3\frac{3}{4}$ | $7\frac{1}{2}$ | 11 | $14\frac{1}{2}$ | 18 | 22 | 26 | 29 | $32\frac{1}{2}$ | 36 |
| 2,200 | 2 | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 | 36 | 40 |
| 2,500 | $2\frac{1}{4}$ | $4\frac{1}{2}$ | 9 | $13\frac{1}{2}$ | 18 | $22\frac{1}{2}$ | 27 | $31\frac{1}{2}$ | 36 | $40\frac{1}{2}$ | 45 |
| 2,800 | $2\frac{1}{2}$ | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 3,000 | $2\frac{7}{8}$ | $5\frac{3}{4}$ | $11\frac{1}{2}$ | $17\frac{1}{4}$ | 23 | $28\frac{3}{4}$ | $34\frac{1}{2}$ | $40\frac{1}{4}$ | 46 | $51\frac{3}{4}$ | $57\frac{1}{2}$ |
| 3,200 | 3 | 6 | 12 | 18 | 24 | 30 | 36 | 42 | 48 | 54 | 60 |
| 3,500 | $3\frac{1}{8}$ | $6\frac{1}{4}$ | $12\frac{1}{2}$ | $18\frac{3}{4}$ | 25 | $31\frac{1}{4}$ | $37\frac{1}{2}$ | $43\frac{3}{4}$ | 50 | $56\frac{1}{4}$ | $62\frac{1}{2}$ |
| 3,800 | $3\frac{1}{8}$ | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 |
| 4,000 | $3\frac{3}{4}$ | $7\frac{1}{4}$ | $14\frac{1}{2}$ | $21\frac{3}{4}$ | 29 | $36\frac{1}{4}$ | $43\frac{1}{2}$ | $50\frac{3}{4}$ | 58 | $65\frac{1}{4}$ | $72\frac{1}{2}$ |

† Excerpt from Bernard MacDonald's "Skeleton Mining Report," with the Author's kind permission.

## INCLINED PLANE.

**Rule.**—Multiply the combined weights of ore, car and rope by the depth, and divide by the length of the incline. The result will be an equivalent weight raised vertically. For horse power see the Table for Hoisting.

**Example.**—What horse power is necessary to hoist 4,000 pounds at the rate of 300 feet per minute, up an incline 2,000 feet long and 250 feet deep:

$$\frac{4{,}000 \times 250}{2{,}000} = 500 \text{ lbs.}$$

In the hoisting table it will be found that to hoist 1,000 pounds 300 feet per minute requires 11 horse power, therefore 500 pounds will require $5\frac{1}{2}$ horse power.

# LIST OF USEFUL BOOKS AND BULLETINS FOR REFERENCE.

## MINERALOGY—

A Text Book of Mineralogy. By E. S. Dana
Mineralogy. By H. A. Miers
Minerals and How to Study Them. By E. S. Dana
Minerals in Rock Sections. By L. M. Luquer
Minerals of Commercial Value. By D. M. Barringer
Tables for the Determination of Minerals. By Persifor Fraser
Mineralogy. By F. Rutley

## LITHOLOGY—

Rocks, Classified and Described. By B. Von Cotta and P. H. Lawrence
Aids to Practical Geology. By Professor Grenville Cole

## GEOLOGY—

Geology for Students. By A. H. Green
Text Book of Geology. By Sir Archibald Geikie
Elements of Geology. By Professor J. Le Conte
Geology Applied to Mining. By J. E. Spurr
Structural and Field Geology. By James Geikie
Mining Geology. By James Park
Rocks, Rock Weathering and Soils. By G. P. Merrill

## ORE DEPOSITS—

Genesis of Ore Deposits. By Professor Franz Pōsepny, and others
The Nature of Ore Deposits. By Dr. R. Beck. Translated by W. H. Weed
A Treatise on Ore Deposits. By J. A. Phillips and H. Louis
Ore Deposits of the U.S.A. and Canada. By Professor J. F. Kemp

## ECONOMIC GEOLOGY—

Economic Geology of the United States. By H. Ries
The Non-Metallic Minerals: their occurrence and uses. By G. P. Merrill

## SAMPLING—

Sampling and Estimation of Ore in a Mine. By T. A. Rickard

## MINING—

A Text Book of Ore and Stone Mining. By Sir C. Le Neve Foster and B. H. Brough
A Text Book of Coal Mining. 5th edition. By Herbert W. Hughes
Colliery Working and Management. By H. Bulman and R. A. S. Redmayne
The Witwatersrand Goldfield. By S. J. Truscott
A Manual of Mining. By M. C. Ihlseng
Economics of Mining. Edited by T. A. Rickard

## EXPLOSIVES—

Manual of Explosives. By C. De Kalb
Testing Explosives. By C. E. Birchel and Alex. Larsen

## BLASTING—

The Blasting of Rocks. By A. O. and Z. W. Daw

## TIMBERING—

Mine Timbering. By W. Sanders, B. MacDonald, and others
Mine Timbering (Bulletin). By W. H. Storms.

## PRIME MOVERS—

Modern Power Generators. Edited by J. W. French
Water and Hydraulic Motors. By P. R. Björling
Hydraulic Power and Machinery. By H. Robinson
Steam (Bulletin). By Babcock & Wilcox
Producer Gas and Gas Producers. By S. S. Wyer
Gas Engines and Producer Gas Plant. By R. E. Mathot
Electricity as Applied to Mining. By A. Lupton, G. D. Parr and H. Perkin
Electrical Practice in Collieries. By D. Burns.
Electric Power Transmission. By Louis Bell

## PUMPING—

Pumping Machinery. By H. Davey
Mine Drainage Pumps, &c. (Bulletin). By H. C. Behr
Cornish Mine Drainage. By S. Mitchell and J. T. Letcher

## COMPRESSED AIR—

Compressed Air. By G. D. Hiscox
Compressed Air. By Frank Richards

## HOISTING—

Winding from Great Depths. By H. C. Behr

## TRANSPORT—

Road Making and Maintenance. By Thomas Aitken
Mechanical Handling of Material. By G. F. Zimmer
Wire Rope Transmission (Bulletin). Trenton Iron Works, N.J.
Light Railways at Home and Abroad. By W. H. Cole

## DIAMOND DRILLING—

Diamond Drilling. By G. A. Denny

## ASSAYING, &c.—

Chemical Arithmetic (Elementary). By S. Lupton
Engineering Chemistry. By Thomas B. Stillman
Chemistry for Engineers. By B. Blount and A. G. Bloxam
Engineering Chemistry. By H. J. Phillips
Physics and Chemistry of Mining. By T. H. Byrom
Metallurgical Analysis. By W. A. Macleod and B. A. Walker
Tables of Quantitative Metallurgical Analysis. By J. J. Morgan
Microscopic Analysis. By F. Osmond and J. E. Stead
Technical Method of Ore Analysis. By A. H. Low
Metallurgical Laboratory Notes. By Professor H. M. Howe
Notes on Assaying. By Richard W. Lodge
The Fire Assay of Gold, Silver and Lead in Ores and Metallurgical Products. By L. S. Austin
Western Mill and Smelter Methods of Analysis. By P. H. Argall
A Manual of Practical Assaying. By H. van F. Furman
Notes on Assaying. By P. Ricketts and E. Miller
A Text Book of Assaying. By C. and J. J. Beringer
Mitchell's Manual of Assaying (with Bullion Tables). Edited by Sir W. Crookes
Analysis and Commercial Value of the Rare Metals. By J. Ohly
Assaying (3 vols.). By C. H. Aaron
Electro-Analysis. By Edgar F. Smith

## METALLURGY—

Metallurgy of Gold. By J. Kirke Rose
Elements of Metallurgy. By J. Arthur Phillips and H. Bauerman
An Introduction to the Study of Metallurgy. By Sir W. Roberts-Austen
Handbook of Metallurgy. By Carl Schnabel. Translated by Professor H. Louis
Metallurgy of the Common Metals. By L. S. Austin
Metallurgical Calculations. By Joseph W. Richards
The Systematic Treatment of Metallurgical Waste. By L. Parry
Metallurgy of Iron. By Professor Turner
Metallurgy of Iron and Steel. By B. Stoughton
The Metallurgy of Steel. By Professor Henry M. Howe
Iron, Steel and other Alloys. By Professor Henry M. Howe.
Metallurgy of Steel. By F. W. Harbord

## GOLD MILLING—

Stamp Milling of Gold Ores. By T. A. Rickard
Mining and Milling in Western Australia. By A. G. Charleton
Handbook of Gold Milling. By Professor H. Louis
West Australian Metallurgical Practice. By Frank Allen
Australian Mining and Metallurgy. By Donald Clark
Deep Level Mines of the Rand. By G. A. Denny
Gold Milling. By C. G. Warnford Lock

## CYANIDE PRACTICE—

Cyanide Practice. By Alfred James
Cyaniding Gold and Silver Ores. By H. F. Julian and E. Smart
Cyanide Process. By Professor J. Park
Recent Cyanide Practice. Edited by T. A. Rickard
Cyanide Process. By F. L. Bosqui

**CHLORINATION—**

The Chlorination Process. By E. B. Wilson

**ORE DRESSING—**

Die Mechanische Aufbereitung von Erzen. By O. Bilharz
Die Aufbereitung der Erze. By C. Linkenbach
Ore Dressing. By Professor R. H. Richards

**SILVER—**

The Metallurgy of Silver. By H. F. Collins
Hydro-Metallurgy of Silver. By Ottokar Hofmann
Lixiviation of Silver Ores. By C. A. Stetefeldt
Roasting. By C. H. Aaron

**LEAD—**

The Metallurgy of Lead. By H. F. Collins
Metallurgy of Lead. By H. O. Hofman
Lead Smelting and Refining. By W. R. Ingalls
Lead and Copper Smelting and Converting. By H. W. Hixon
Lead Smelting. By M. W. Iles

**COPPER—**

The Copper Mines of the World. By W. H. Weed
The Copper Mines of Lake Superior. By T. A. Rickard
The Copper Handbook. By Horace J. Stevens
The Principles of Copper Smelting. By Dr. E. D. Peters
Modern Copper Smelting. By Dr. E. D. Peters
The Hydro-Metallurgy of Copper. By M. Eissler
Matte Smelting. By H. Lang
Pyrite Smelting. Edited by T. A. Rickard

**ZINC—**

The Metallurgy of Zinc and Cadmium. By W. R. Ingalls
Production and Properties of Zinc. By W. R. Ingalls

**TIN—**

Tin Deposits of the World. By Sydney Fawns
Notes on Tin Mining. By A. G. Charleton
Metallurgy of Tin. By P. T. Thibault

**ELECTRO-METALLURGY—**

A Treatise on Electro-Metallurgy. By W. G. Macmillan
Electro-Smelting and Refining. By Dr. W. Borchers and W. G. Macmillan

**MACHINERY, &c.—**

Metallurgical Machinery. By H. C. Jenkins
Machinery for Metalliferous Mines. By E. H. Davies
Notes on Metallurgical Mill Construction. By W. R. Ingalls
Gold Mining Machinery. By W. H. Tinney

**SURVEYING—**

Field Book for Engineers. By Henck
Mine Surveying. By B. H. Brough
Mine Surveying. By Arnold Lupton
A Treatise on Surveying. By R. Middleton and O. Chadwick
A Treatise on Surveying. By W. M. Gillespie
Preliminary Surveys and Estimates. By T. H. Gribble
The Draughtsman's Handbook. By G. André
Alphabets (Lettering). By F. S. Copley
Traverse Tables. By H. Louis and G. W. Caunt.
Plane Surveying. By J. C. Tracy

**CONSTRUCTION—**

Engineering Specifications and Contracts. By H. M. Haupt
Earthwork and its Costs. By H. P. Gillette
Materials of Construction. By R. H. Thurston
Reinforced Concrete. By C. F. Marsh
Matheson's Aid Book for Engineers
The Works Managers Handbook. By W. S. Hutton
The Practical Engineer's Handbook. By W. S. Hutton
Carpentry and Joining. By Tredgold and Tarn
Carpentry. By Tredgold and Hurst
Practical Blacksmithing. By E. M. Richardson

**LAW—**

The Mining Laws of the British Empire. By C. J. Alford
Mining Laws of the World. O. Walmesley
The Mining Laws of Spain. Translated by John A. Jones
Mining Mineral and Geological Law. By C. H. Shamel

**TOOLS—**

A Manual of Mining Tools. By W. Morgans

**HYDRAULIC MINING—**

Design and Construction of Dams. By E. J. Wegmann
Designing and Construction of Storage Reservoirs. By Arthur Jacobs
A Practical Treatise on Hydraulic Mining. By A. J. Bowie
Hydraulic Mining. By Geo. H. Evans
Hydraulic Mining. By Capt. Longridge

**GOLD DREDGING—**

Gold Dredging. By Capt. Longridge
Dredging for Gold in California. By D'Arcy Weatherbe

**COMMERCIAL—**

Mine Accounts and Mining Book-keeping. By Professor J. G. Lawn
Organization of Gold Mining Business. By Nicol Brown
Mine Accounts and Cost Sheets. By A. G. Charleton
Book-keeping Principles and Practice of Double Entry. By L. W. Hawkins
What a Business Man Ought to Know. Anonymous
The Commercial Handbook and Office Assistant. By M. Crowley
Commercial Knowledge. By A. Warren
Commercial Correspondence in Five Languages. By C. E. Barker

**MISCELLANEOUS—**

The Gold Mines of the World. By J. H. Curle
Lubrication and Lubricants. By L. Archbutt
Metric Measures. By Latimer Clark
Reference Tables (Conversion Factors). By Carl Hering
Mining Tables. By F. Hatch and Vallentine
Hydraulic Tables. By Gardner Williams and A. Hazin
Pocket Book of Engineering Formulæ. By Sir Guildford Molesworth and J. T. Hurst
Mechanical Engineer's Reference Book. By H. H. Suplee
Mechanical Engineer's Pocket Book. By W. Kent
Miner's Pocket Book. By C. G. Warnford Lock
The Complete Measurer. By R. Horton
Engineer's Sketch Book. By T. W. Barber
Mining Code. By Bedford McNeill
Mine Bell Signals.
The Company's Secretary. By W. H. Fox
The Mining Year Book.
Personal Hygiene. By Alf. A. Woodhall
Hints to Travellers. (The Royal Geographical Society).
Skeleton Mining Report Book. By B. MacDonald
The Wealth of Nations. By Adam Smith

NOTE.—Most of these Books can be obtained through Mr. Edward Walker, 808, Salisbury House, E.C.; The Engineering and Mining Journal, 6, Bouverie Street, E.C.; or the Mining Journal, 46, Queen Victoria Street, E.C.

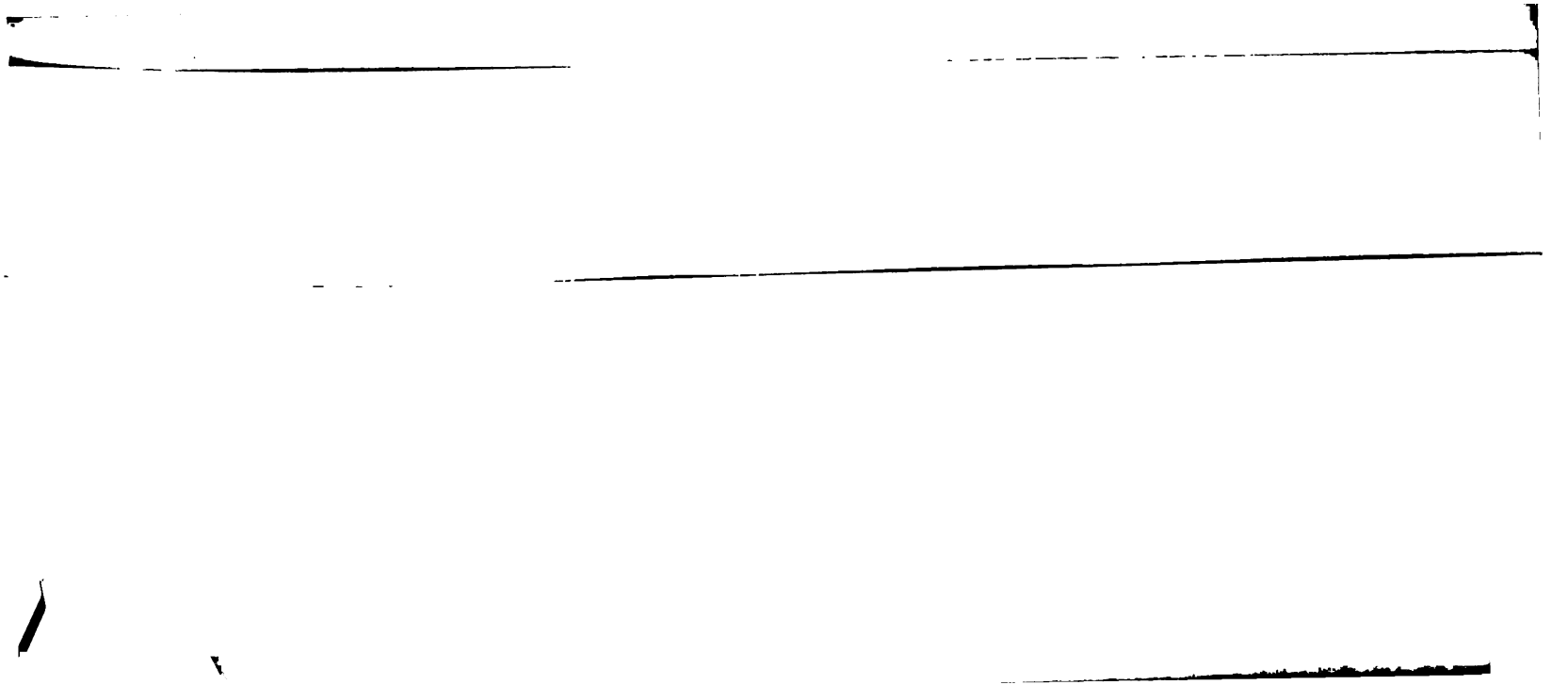
---

If you are making an inspection abroad don't fill your "kit" with unnecessary books. Make a judicious selection, if necessary, from the above list, but take Molesworth's and Lock's Pocket-books with you, and any important "papers" of the Institution of Mining and Metallurgy or American Institute of Mining Engineers (in pamphlet form) that treat of the District you are visiting, or any special problems you are called upon to investigate.

A plan of the mine-workings, on tracing-cloth upon a small, convenient scale, will be found handy for use underground.

# GENERAL NOTES.

PAGE 163.



# EXTRACTS FROM PRESS OPINIONS.

(1st Edition).

**DAILY TELEGRAPH, 26th October, 1896.**

"Charleton's 'Report Book for Mining Engineers' is designed to enable Mine Purchasers or Mine Owners to obtain, in concise form, a comprehensive and systematic Report upon Properties they wish to either acquire or sell."

**MINING JOURNAL, 24th October, 1896.**

"The book might easily have made its appearance under another title, that, namely, of 'Reporting on Mines Made Easy,' since its major part is occupied with a skeleton report upon a supposititious property, going fully into all the minutiæ of claims, reefs, strata, locality and means of communication, and it must be admitted that in the case of a faithful fulfilment of the conditions set out here in full, a mining engineer's report would certainly have the recommendation of completeness. Nothing that could possibly make the book more useful appears to have been neglected. By its style, arrangement, and general get up, the book recommends itself to favourable attention, and there is reason to expect that it will become a prime favourite among mining engineers."

**MINING WORLD, 24th October, 1896**

"Like all Mr. Charleton's works this one is distinguished by the extreme care with which it has been prepared No one, not himself a practical engineer, could have devised a book like this so well designed to meet the requirements of mining superintendents and engineers. As we glance through its pages, nothing that can aid the mining manager or the engineer seems to have been omitted. Furnished with such a work as this, it becomes easy for the manager not merely to make his reports, but to keep in a condensed form the data upon which they are based. When directors of companies are sending supplies to their managers abroad, they might, at small expense, include a copy of this book. We are perfectly certain it would be welcomed by their managers—particularly those who desire above all things to be accurate."

**STATIST, 24th October, 1896.**

"Not only mining experts who have to use such a work, but those engaged in connection with companies that finance mining undertakings, will find useful suggestions of data to be ascertained in the 'Report Book for Mining Engineers,' by A. G. Charleton, M.E., Dashwood House. This book for the pocket sets out in skeleton form a host of different questions that have to be answered by any one going over a mining property as to area, position, history, accessibility, titles, details as to ore contents, fuel, water-power, food, labour, &c."

**NEW YORK ENGINEERING AND MINING JOURNAL, 20th November, 1896.**

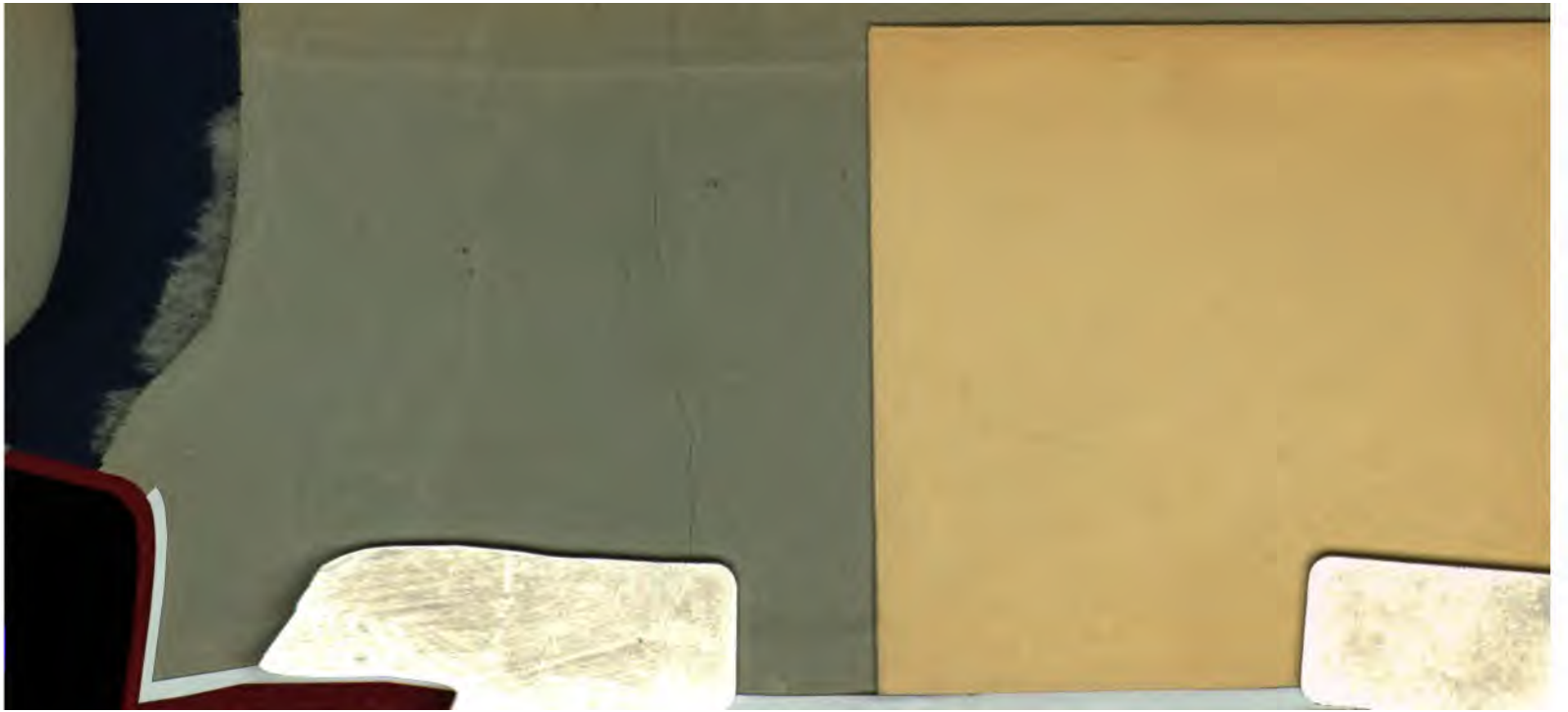
"Every mining engineer who has to examine and report on mining properties feels the need of a guide in taking notes and recording what he sees; and doubtless many have formulated something of the kind for themselves. Much time may be saved by following such a guide in getting the information, and a report can be more easily and better prepared afterward than from a mass of disjointed notes. In preparing this very complete skeleton report the author has not relied altogether upon his own experience, but acknowledges freely the suggestions of others, and has especially made use of the somewhat similar note-book prepared by Mr. Bernard MacDonald, which was noticed in these columns about two years ago. The present report is a very complete one, and its use will be of great service to mining engineers as a guide as well as a note-book for actual use while making their examinations. It is published in convenient pocket size."

**FINANCIAL NEWS, 15th January, 1897.**

"If all mining reports were modelled on the plan laid down here, shareholders would have every tittle of information vouchsafed before they invested in a property, and would be able to judge—as they are hardly at present able to do in the majority of instances—of the desirability, or otherwise, of making the investment suggested. This is a volume which has an interest for speculators as well as for mining engineers. It affords plain indication of points which engineers should meet and deal with; and if these points are not handled in reports, people with money to spare are placed in a position in which they can ask themselves why they are shirked."

89083904029

b89083904029a



89083904029

B89083904029A